Container Movements & Traffic Mitigation Measures

Port of Charleston

prepared for:
The South Carolina Department of Commerce

by:
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Acknowledgements

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Data and assistance were provided by the South Carolina State Ports Authority, the South Carolina Department of Transportation, the South Carolina Public Railways (a division of the Department of Commerce), Charleston area motor carriers, CSX Transportation, and the Norfolk Southern Railway.

Wilbur Smith Associates is grateful for their cooperation and assistance.

EXHIBITS

EXECUTIVE SUMMARY

Introduction

This study was commissioned by the South Carolina Department of Commerce, in cooperation with the South Carolina State Ports Authority, South Carolina Department of Transportation, and South Carolina Transportation Infrastructure Bank (which financed the study). The scope of the consultant's investigation was very specific: to determine the volume and impact of port-related truck traffic on the level of service of Charleston area highways (I-26 and I-526), and to identify and evaluate possible mitigation measures to alleviate the impact of such port-related truck traffic. The study effort was not intended to answer the wide range of related issues, questions, and concerns associated with planned expansion of the Port of Charleston.

Study Purpose

This study was initiated to specifically identify the:

- Quantity and nature (origins/destinations, routing) of port-related truck traffic in the Charleston area;
- Means of mitigating the impact of that traffic; and
- Relevant costs and benefits of those actions, including possible "inland port" locations.

Consideration of other issues relative to expansion of the Charleston Port are certainly pertinent to the overall question, but not part of this study. For example, the following questions are beyond the scope of this study:

- Feasibility of the proposed Daniel Island terminal.
- Community, environmental, and infrastructure impacts of building/not building the Daniel Island terminal.
- Feasibility of expanding port capacity by developing the US Army Depot.
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Background

Expansion of the Port of Charleston, which has become a major east coast container port, has been deferred due to concerns over local quality-of-life issues. Port traffic through Charleston's three container terminals (Wando Welch, North Charleston, and Columbus Street) is expected to reach 4 million TEUs by 2020. The existing three public terminals are near capacity now, and little additional capacity can be gained through efficiency measures. The South Carolina State Ports Authority and others believe that if Charleston is to remain a viable, competitive port, additional container capacity is needed within the short term (five to seven years).

The quality-of-life issues, in large part, have resulted from concerns over the generation of additional truck traffic and the impact of this traffic on the area's highway network. The South Carolina State Ports Authority has revised its plan for the proposed Daniel Island terminal in response to these concerns and is asking for permission to seek the necessary permits to begin a very rigorous public discussion and environmental process leading to a decision on the revised plan.

A key to port expansion is an analysis of data for trucks that use existing Charleston terminals. The public perception is that trucks in general contribute significantly to congestion of Charleston's major roadways (Interstate Routes 26 and 526), and that port-related truck traffic is a major component of the traffic stream. This study's primary charge was to:

- Collect and examine previous work relative to Charleston area truck traffic.
- Identify port-related truck traffic through new data collection, including the origin and destination of port-related truck traffic, its volume, the vehicular type, when it travels, and what routes it takes.
- Conduct a traffic assignment model to identify which roadways are used by port-related truck traffic.
- Identify the costs and benefits of a variety of truck mitigation measures, including both highway and rail solutions.
- Specifically, discuss the viability of an "inland port" to mitigate truck traffic. An inland port is a facility located outside Charleston that serves as a staging area/distribution center for both inbound and outbound Charleston port containers. In concept, such a facility would be located to attract use by all shippers, highway and rail, and would have a direct rail line to the terminals. Many believe an inland port would remove truck traffic from the area roadways.
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Methodology

The consultant team conducted a data collection process using several different approaches and methods.

- Gate counts were conducted at the three Charleston terminals. These counts were for the duration of terminal operating hours and classified all vehicles leaving/entering each terminal by type.
- Highway counts were conducted by auditing videotapes and live SCDOT feeds on both I-26 and I-526. The focus of these counts was to count truck traffic and determine how much of the truck traffic was port-related. The SCDOT was very helpful in providing information and access to their facilities to help conduct this element.

- Container gate flows from each of the three terminals were determined from data provided by the South Carolina State Ports Authority. Volume data was collected for each terminal (total) and classified as inbound/outbound, loaded/empty.
- Motor carrier companies were surveyed to determine the origin/destination of their shipments.
- Traffic mitigation efforts were reviewed and costs identified. The consultant team utilized existing sources of information and did not prepare new capital cost estimates.
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Results

The results of the data collection portion of the study are as follows:

- Terminal gate traffic at Wando Welch is the heaviest of the three terminals (52 percent of all port traffic uses Wando Welch).
- Wando's traffic has a higher percentage of trucks with containers (45 percent) than the other terminals.
- Highest share of auto traffic (as a percent of all traffic) is at Columbus Street (54 percent).
- Heaviest count location for highway truck traffic was I-526 at the Cooper River Bridge (10.4 percent) – other locations range from 3.7 percent to 8.5 percent trucks. Port-related truck traffic is a major part of the traffic steam only at the Cooper River (73 percent of the truck traffic), while it ranges from 34 percent to 54 percent at the other locations. This is an expected observation as most Wando traffic uses I-526. **Trucks are not a significant part of the Interstate traffic stream, and port-related trucks are a heavy contributor only on I-526 between I-26 and Wando. Thus, traffic volumes on Charleston-area interstates are driven by nonport-related traffic.**

- About 25 percent of Charleston's port containers arrive/depart by rail.
- Loaded container gate traffic is heavier than empty containers and, **outbound container traffic is heavier than inbound.** Nearly two-thirds of the container traffic moves through Wando Welch.
- Of the 250 motor carrier companies identified using Charleston port terminals, 20 percent are responsible for nearly 80 percent of the activity. **Over 40 percent of Charleston containers have local origins or destinations, which is significant to the inland port question.** Only 11 percent of the containers move beyond 500 miles and 31 percent move between 200 and 500 miles.
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Mitigation measures examined in the study are as follows:

- **Extended gate hours** at the terminals were implemented in 1998 and could be extended further. Traffic counts show that most trucks move during nonpeak hours now.
- **Adding capacity to I-526** would cost $65 million (restriping only on elevated sections). This would help traffic flow and safety, especially if trucks were restricted to the two right lanes.
- Major improvements to SC Routes 33 and 41 to form a **highway bypass** in the northeast area quadrant would cost more than $300 million and would help remove trucks if used. However, the bypass adds 22 miles to the current routing – the bypass would likely become viable only as I-526 becomes severely congested.
- **Relocation of the existing NS and CSXT intermodal yards** closer to the terminals might reduce truck traffic. However, the $30 million price tag and scarcity of urban land would meet with substantial opposition. In addition, one railroad would experience additional handling costs due to being located off the primary rail access route.

- An **on-dock rail facility at Daniel Island**, including connections to extend the ECB Railroad and improvements to I-526, would cost about $175 million. While there are substantial public and environmental concerns over this measure, it would have a positive impact on removing trucks from area roadways.
- Port expansion into the **US Army Depot adjacent to the North Charleston Terminal** would cost nearly $80 million, including rail and highway upgrades. This measure would temporarily aid areawide port capacity, but have no effect on taking trucks off the roadways. Thus, as a capacity measure it may have merit, especially if the existing rail intermodal yards reach capacity, but not as a truck reduction measure.
- Alternative **nearby rail intermodal terminals** could be located near Charleston: on SC 41 near Charity Church Rd. ($100 million, including rail and highway upgrades); and between I-26 and US 176, "Carnes Crossroads" ($235 million for infrastructure improvements). These new facilities would replace the existing NS and CSXT Intermodal yards in Charleston and remove substantial volumes of trucks from area roadways, but increase transportation costs (due to extra distance). **Implementation of one of these terminals would likely require public subsidies.**
- Construction of an "inland port" located away from Charleston proper would also require public subsidy, and the concept's economic feasibility for Charleston is questionable. The consultant examined potential sites near Holly Hill, Santee, Manning and Rains – each site had one or more positive attributes, including proximity to the interstate system, affordable land, and/or available labor. However, none of the sites is considered attractive enough to merit further consideration, as each lacks access to both intermodal rail systems and none are outside the 500-mile minimum distance needed to attract railroad interest. In addition, because 40 percent of the Charleston container traffic is locally destined, the truck impact is not sufficiently diminished. While the concept of an inland port is indeed possible from an engineering perspective, it does not appear viable without substantial public subsidy.

- The inland port concept has worked in other locales, and it is important to state that, under the right circumstances, an inland port can relieve highway congestion and increase port capacity. This does require the correct blend of public/private financing, industry (railroads and trucking companies) support, cooperation from the port operators, and idealized infrastructure connections.

Seven separate **implementation scenarios** based on potential mitigation measures, including a base case, were studied to determine how the diversion of port-related truck traffic from I-526 would impact "user" costs and the need for future highway improvements and, if so, to what extent.

- With no Port expansion, user costs on I-526 will increase nearly 80 percent between 2001 and 2020.
- User costs increase an additional 9 percent by 2020 if Daniel Island is operational by 2009.
- The rail scenarios offer some user cost reductions, the highest being 12 percent with a 60 percent Rail Diversion at Daniel Island.
- Using the FHWA's Highway Economic Requirements System (HERS) program to estimate future highway needs, additional lanes are required by 2019 using traffic growth rates supplied by SCDOT. **Implementation of any rail alternative has virtually no effect on the highway need – thus the future capacity needs are driven by overall traffic growth, not port-related traffic.**
- Diversion of port-related truck traffic through rail mitigation measures has little impact on highway needs due to conventional traffic.

Based upon our observations, data collected, and technical analysis, the following infrastructure investments appear justified over the short term:

- Charleston's total highway traffic growth will require additional capacity on both I-26 and I-526 to mitigate future congestion.
- If the Daniel island terminal is implemented, an on-dock rail facility would be most effective in reducing port-related truck traffic.
- Because of the high cost and environmental concerns associated with adding lanes to I-526, begin planning efforts to implement the SC 41 bypass (and other improvements) to alleviate future traffic congestion.
- Institute a "freight friendly" planning approach in Charleston that considers freight transportation needs as well as passenger transportation needs.

1

INTRODUCTION

Problem Statement

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- Apply a traffic assignment model to identify which roadways are used by port-related truck traffic.
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With the Wando Welch Terminal (WWT) nearing completion in the early 1990s, (construction of its final phase was underway), the South Carolina State Ports Authority acquired 800 acres on Daniel Island in 1992. It acquired 500 additional acres in 1997, the same year the permitting process began for what would be the new Global Gateway Terminal. Opposition to the project mounted and the proposal was shelved in early 2001.

Later in 2001, a revised development plan for Daniel Island was proposed by the Ports Authority. First, improvements to increase capacity of the existing container terminals – Wando Welch Terminal, North Charleston Terminal (NCT), and Columbus Street Terminal (CST) – would be completed by 2008. Development on Daniel Island would be restricted to the Cooper River side of the island, with future development on the Wando River side permanently restricted (see **Exhibit 1-1** for terminal locations). A comprehensive development plan, coordinated with the South Carolina Department of Transportation and the South Carolina Public Railways, including alternate rail and roadway inland access routes, is to be

EXISTING CHARLESTON TRANSPORTATION INFRASTRUCTURE

LEGEND

- Interstate
- Highways
- Local Roads
- Principal Railroad Network
- Port of Charleston Terminals
- Railroad Intermodal Terminals

0 0.5 1 1.5 2 Miles

N W E S

Ashley Phosphate Rd.
642
61
Dorchester Rd.
52
78
CSXT
NS
CSXT
Rhett Ave.
North Charleston Terminal
ECBR
33
Clements Ferry Rd.
Montague Ave.
26
Norfolk Southern
CSX Intermodal
Leeds Ave.
Azalea Dr.
7
Former Navy Base
COOPER RIVER
WANDO RIVER
526
Proposed Daniel Island Terminal
Long Point Rd.
Wando Welch Terminal
ASHLEY RIVER
7
171
17
78
NS
Meeting Street
17
Columbus Street Terminal
703
Union Pier
52
17
STONO RIVER
171

Exhibit 1-1

Exhibit 1-1

MAP OF EXISTING CHARLESTON TRANSPORTATION INFRASTRUCTURE

developed. Discussions regarding feasibility and work scope are also to be continued with private sector marine companies. Legislative approval is targeted by June 2002, after which a new permitting process would commence.

The initial phase of the scaled-down project would contain 3,000 feet of berth and 200 acres of container yard.

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CONTAINER MOVEMENTS

Container, Roadway and Gate Traffic

- A number of approaches were used to define roadway traffic related to the movement of containers through the Port of Charleston. Counts were conducted at each of the terminal gates which not only provided traffic volumes, but also classified the traffic volumes by vehicular type (i.e., truck, containers, autos, etc.). Similar counts were made at four locations on the urban interstate system (I-26 and I-526).

- Counts at the gates of each of the three port terminals WWT, NCT and CST. Vehicles were classified as those with containers, empty chassis, bobtails (tractors without trailers) and others. The latter category consisted principally of automobiles and delivery/service trucks. The initial traffic counts were conducted in late November/early December between the hours of 7:00 am and 6:00 pm. As requested by the SCDOT, a second set of data was collected in late February/early March at WWT and NCT. This additional data was collected on consecutive days: Thursday, February 28th and Friday, March 1st, 2002 between the hours of 7:00 am and 7:00 pm.

  Exhibit 2-1 summarizes the gate counts. Examination of the data indicates that at the combined terminals, the number of automobiles passing through the gates almost equaled the number of containers. There were differences at individual terminals, however. Chassis and bobtail movements were more equally proportioned.

Exhibit 2-1

TERMINAL GATE MOVEMENTS

	WWT: 11/29/01		WWT: 02/28/02		WWT: 03/01/02		Totals	
Vehicle Types	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
With Containers	2,699	47.0	2,516	42.4	2,679	44.9	7,894	44.7
Empty Chassis	381	6.6	627	10.6	286	4.8	1,294	7.3
Bobtails	821	14.3	562	9.5	858	14.4	2,241	12.7
Others[(1)]	1,842	32.1	2,235	37.5	2,142	35.9	6,219	35.3
TOTALS	5,743	100%	5,940	100%	5,965	100%	17,648	100%

	NCT: 11/29/01		NCT: 02/28/02		NCT: 03/01/02		Totals	
Vehicle Types	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
With Containers	1,289	38.6	1,173	33.8	1,081	35.4	3,543	35.9
Empty Chassis	184	5.5	277	8.0	242	7.9	703	7.1
Bobtails	553	16.6	488	14.1	446	14.6	1,487	15.2
Others[(1)]	1,310	39.3	1,531	44.1	1,284	42.1	4,125	41.8
TOTALS	3,336	100%	3,469	100%	3,053	100%	9,858	100%

Exhibit 2-1 (Continued)
TERMINAL GATE MOVEMENTS

	CST: 11/29/01		Totals	
Vehicle Types	**No.**	**%**	**No.**	**%**
With Containers	573	28.0	573	28.0
Empty Chassis	75	3.6	75	3.6
Bobtails	295	14.3	295	14.3
Others[(1)]	1,114	54.1	1,114	54.1
TOTALS	2,057	100%	2,057	100%

(1) Observations indicated that the majority were automobiles

SOURCE: Wilbur Smith Associates

WWT – Wando Welch Terminal
NCT – North Charleston Terminal
CST – Columbus Street Terminal

Highway counts were made at four locations on I-26 and I-526, (see **Exhibit 2-2**). The counts at two of the four locations were made from videotapes which were prepared on November 8, 2001, while counts at I-26 and Ashley Phosphate Road were made three times. At the fourth location, the Cooper River Bridge on I-526, counts were made from a live feed from the SCDOT's incident management cameras at that location on November 19, 2001, February 28, 2002 and March 1, 2002.

- The results of the counts are contained in the **Exhibit 2-3**. The counts were made over a 12-hour period (6:00 am to 6:00 pm) although the limited daylight hours in November, February and March created difficulties with both the first and 12th hours of the counts. Exhibit 2-3 depicts actual 24-hour volumes, and the 2000 AADT provided by the SCDOT. The AADT volumes are less than the 24-hour counts, as AADT reflects an *average* traffic volume over an entire week for each week of the year. Total trucks and port-related trucks (containers and bobtails) are taken from the actual data collected as part of this study. The port-related traffic, in fact all trucks, is significant only on I-526 east of I-26 (counts taken on the Cooper River Bridge), which reflects 10.4 average percent overall, with average of 7.6 percent being port-related.

- A better view of the impacts of port-related truck traffic is shown in **Appendix A**. These exhibits summarize the traffic counts by each hour. The data indicates that truck trips are concentrated during the off-peak hours as opposed to the peak commuter hours, which are between 7:00 – 9:00 am, and 4:00 – 6:00 pm.

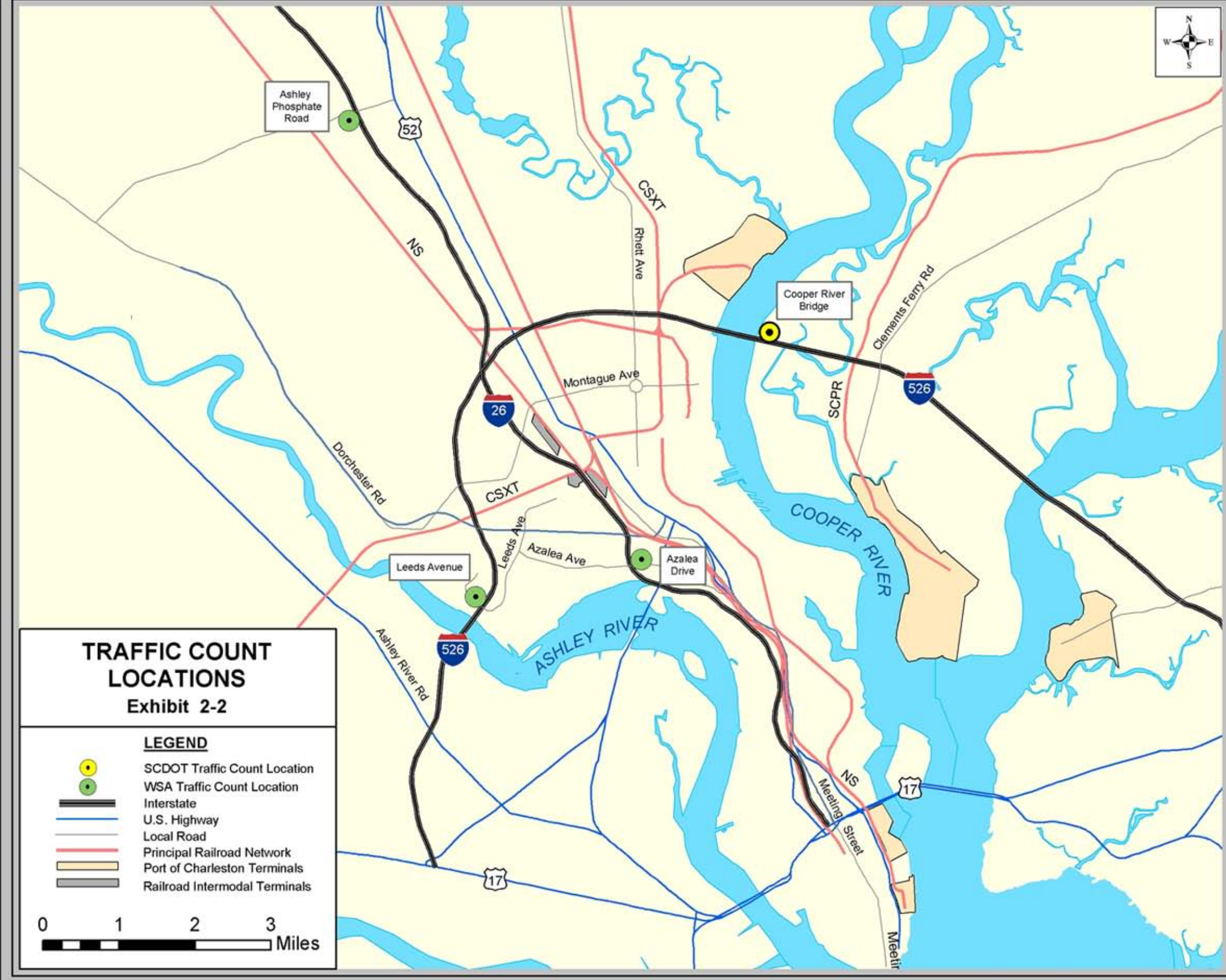

N
W
E
S
Ashley Phosphate Road
52
NS
CSXT
Rhett Ave
Cooper River Bridge
Clements Ferry Rd
SCPR
526
Montague Ave
26
Dorchester Rd
CSXT
Leeds Ave
Azalea Ave
Leeds Avenue
Azalea Drive
COOPER RIVER
ASHLEY RIVER
Ashley River Rd
526
17
NS
Meeting Street
17
Meetin
TRAFFIC COUNT LOCATIONS
Exhibit 2-2
LEGEND
SCDOT Traffic Count Location
WSA Traffic Count Location
Interstate
U.S. Highway
Local Road
Principal Railroad Network
Port of Charleston Terminals
Railroad Intermodal Terminals
0 1 2 3
Miles

Exhibit 2-3

CURRENT TRAFFIC COUNTS

Count Location	Date	24-Hour Count[3]	12-Hour Count[4]	2000 AADT[3]	% 12-Hr Total Trucks	% 12-Hr Port-Related	% 12-Hr Non-Port
I-526 at Cooper River Bridge	11/19/01	56,065	45,943	43,800	11.6	8.5	3.1
	02/28/02	58,221	47,710	43,800	10.4	7.2	3.2
	03/01/02	57,637	47,231	43,800	9.3	7.1	2.2
I-526 at Leeds Ave.	11/08/01	NA	44,340[1]	60,200	3.7	2.0	1.7
I-26 at Ashley Phosphate Rd	11/19/01	80,385	61,717	68,200	8.2	2.7	5.5
	02/28/02	79,436	60,988	68,200	10.1	3.8	6.3
	03/01/02	88,586	68,013	68,200	7.1	3.1	4.0
I-26 at Azalea Ave.	11/08/01	NA	50,432[2]	78,600	4.9	1.7	3.2

1 11 hrs

2 10 hrs

SOURCE:

3 SCDOT

4 Wilbur Smith Associates

Truck Movement Data

> Data on terminal gate movements for each Charleston terminal were provided by the South Carolina State Ports Authority from its own records and those of the steamship lines and private terminal operators. The data covered one work week (October 22-26, 2001) of activity at the three SCSPA container terminals shortly after commencement of the study. The month of October, based on activity levels over the last three years, is a typical month (1/12 of year).

> In all, the data contained over 21,000 gate movements. After eliminating duplicate files, those containing chassis but no containers and other invalid records, a total of 21,104 valid records remained. Approximately 9,100 of these records accounted for 3,850 containers that made multiple moves through the gates during the week (various combinations of empty and loaded trips). Container gate activity is summarized in **Exhibit 2-4**. Note that traffic flow entering and exiting each of the terminals is more or less balanced, although about 10 percent of the movements could not be classified ("unknown"). Loaded containers exceeded empties by 20 percent (12,800 vs. 8,300).

> Gate activity by terminal is the subject of **Exhibit 2-5**. Wando Welch Terminal had the most activity for the week, almost 2/3 of the total container movements, with the North Charleston Terminal second with over 20 percent. Columbus Street Terminal was the least active of the three, handling 14 percent of the overall gate movements.

Exhibit 2-4

CONTAINER GATE FLOWS (in thousands)

NCT, WWT and CST

OCTOBER 22-26, 2001

	IN	OUT	UNKNOWN	TOTAL
Loaded	5.8	6.4	0.6	12.8
Empty	3.7	2.8	1.8	8.3
Total	9.5	9.2	2.4	21.1

Source: SC State Ports Authority

Exhibit 2-5

TERMINAL ACTIVITY

October 22-26, 2001

Terminal	Records	%
Wando Welch	13,434	64
North Charleston	4,724	22
Columbus Street	2,946	14
Totals	**21,104**	**100**

Source: Wilbur Smith Associates

Motor Carrier Survey

- A general survey was completed to determine the origin and destination of truck movements to/from each of the terminals. Information on motor carriers entering and exiting each terminal was provided by the South Carolina Ports Authority. This data file was then sorted by specific motor carrier company.

- Over 250 motor carrier companies serving Charleston's terminals were identified from the data files. Just over 50 companies, (or about 20 percent of the total) were found to account for nearly 80 percent of the recorded gate movements. These 50 carriers were responsible for over three-quarters of the activity at the gates. The remaining 200 draymen accounted for the remaining 20 percent, many of which handled only one or two containers during the surveyed time period (one week).

- The top 50 carriers were contacted and forwarded records of their specific gate movements. The request was made to determine the origin (original) and destination (eventual) of each container. Due to the size of some of the files, assistance in extracting the information was voluntary. Due to the sensitive nature of this information, all data obtained are considered to be proprietary and are presented only in aggregated form.

- Twenty-six carriers of the original 50 carriers contacted, accounting for 9,843 records (47 percent of the total), provided detailed responses or permitted the data to be gathered from their records. Twenty-five carriers, including some not in the top 50, provided estimates by telephone without a detailed record search. Responses typically divided

local traffic from non-local, and the latter by state. These responses accounted for 4,231 records (20 percent of the total). In all, the two response categories accounted for 2/3 (67 percent) of the total records.

> While the response is certainly statistically significant, the process revealed that the container transport industry is very segmented. Motor carriers were found to move containers on behalf of certain steamship lines, certain industries, and/or geographic coverage, including local vs. over-the-road (long distance). The point is that by missing data from even one cartage company, it is possible that an entire industrial segment or geographic location could be excluded from the results.

> Origins and destinations of containers are summarized in **Exhibit 2-6**. The summary differentiates between the responses which resulted from detailed record searches and estimates provided by telephone without a record search (although some were based on record reviews). Based on this data, 56 percent of the containers move between Charleston and the rest of South Carolina, which includes the two local intermodal rail terminals. Origins and destinations of containers trucked outside the Charleston area are depicted on **Exhibit 2-7**. Only 11 percent of the containers move beyond a 500-mile radius of Charleston, 58 percent originate or terminate within 200 miles, and 31 percent between 200 and 500 miles. In all, traffic is originated or terminated at 314 different locations.

> Over 40 percent of the containers have Charleston area origins or destinations, most related to local railroad intermodal facilities (with original origins and final destinations out of the Charleston area). The remaining local Charleston movements are either between marine terminals, warehouses, or local industries. Warehouses, especially,

Exhibit 2-6

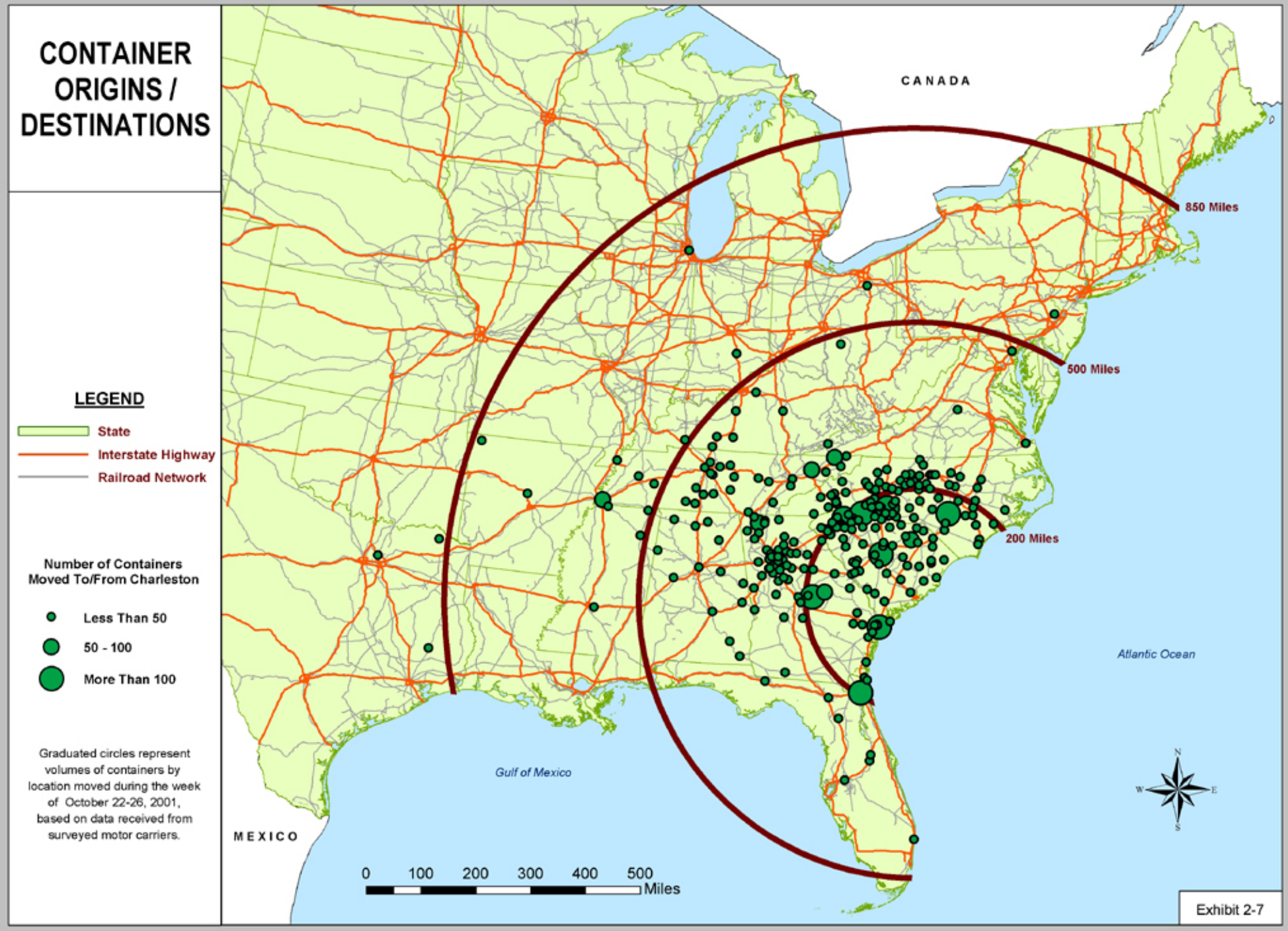
Origin/Destination Summary

	RR	CHS	SC	OS	Total
Record Search	27.8%	18.1%	15.1%	39.0%	100.0%
Telephone	12.0%	15.9%	17.5%	54.6%	100.0%
Weighted Average	22.9%	17.5%	15.8%	43.8%	100.0%

RR – Rail Intermodal Terminal (local)
CHS – Local Charleston
SC – South Carolina
OS – Out-of-State

Source: Wilbur Smith Associates

CONTAINER ORIGINS / DESTINATIONS



LEGEND

- State
- Interstate Highway
- Railroad Network

Number of Containers Moved To/From Charleston

- Less Than 50
- 50 - 100
- More Than 100

Graduated circles represent volumes of containers by location moved during the week of October 22-26, 2001, based on data received from surveyed motor carriers.

Exhibit 2-7

can generate secondary trips as containers are stripped and distributed in other trucks, or the operation is reversed. Containers associated with out-of-town transport, either South Carolina or out-of-state origins/destinations, can also generate secondary trips. This occurs with motor carriers who have local drivers that move containers between local yards and the marine terminals and over-the-road drivers that move containers to and from the eventual origins and destinations (see **Exhibit 2-8** for the location of local truck yards and warehouses identified in the survey). These trips are tabulated as South Carolina or out-of-state trips as appropriate in Exhibit 2-6, rather than local trips.

Roadway Assignment

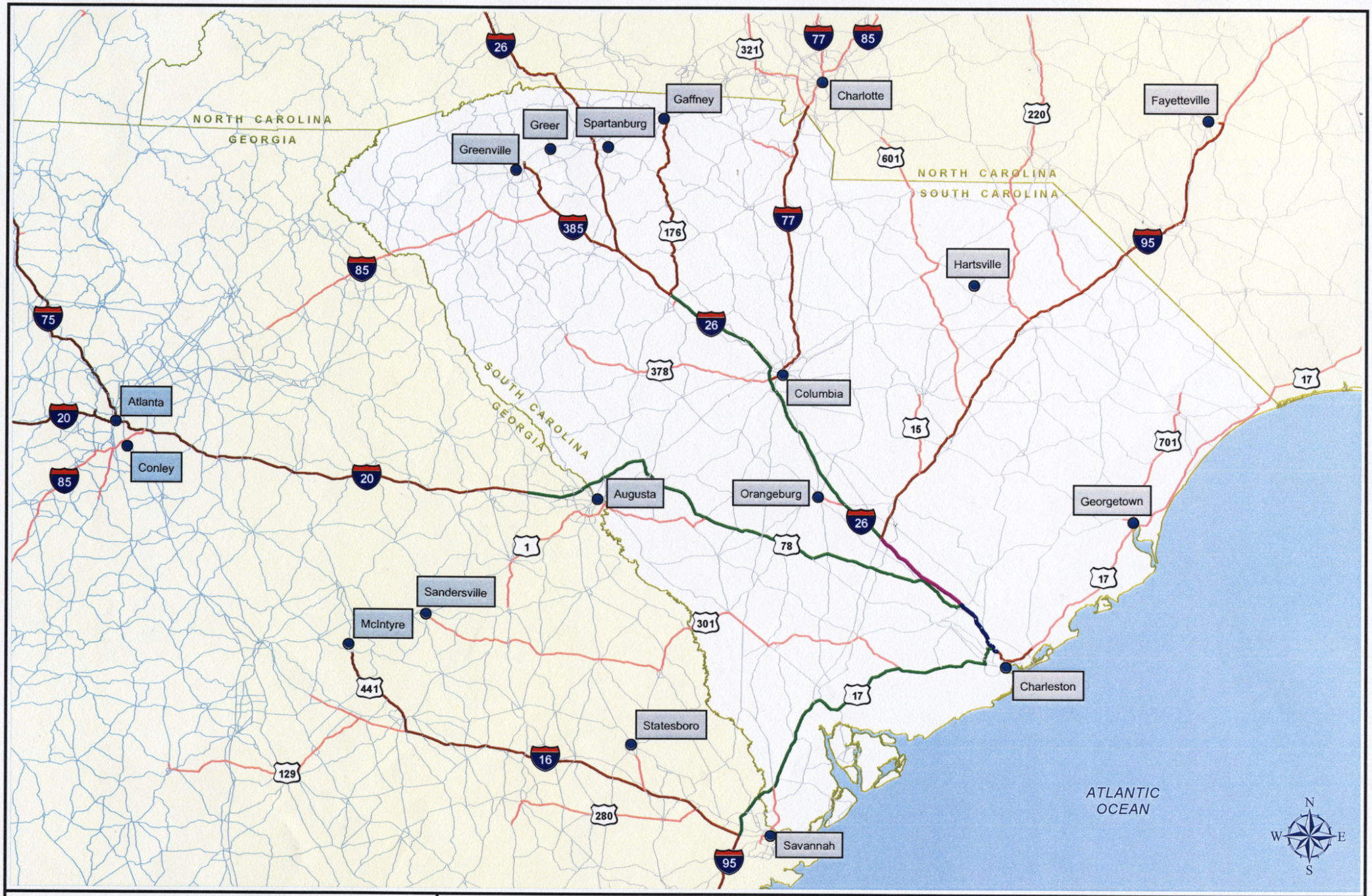
- To conduct a truck assignment, a national network of major highways and roads was created using the National Highway Planning Network (version 4.0), a geographic database maintained by the United States Bureau of Transportation Statistics. A travel demand model network was created using TransCAD transportation modeling software based on this highway system. Using the origin and destination pairs and the number of container movements between those pairs from the container carrier survey, travel times based on distance and speed limits are attributed to all sections of the road network. Truck trips are then routed, or assigned, along those road segments between the Charleston area and other locations according to the shortest travel time. Using these assigned truck volumes, an analysis was conducted comparing the amount of trucks likely to travel on those assigned road segments and the average annual daily traffic counts from the South Carolina Department of Transportation.

TRUCK YARDS AND WAREHOUSE LOCATIONS

- Truck movements originating or destined for the Port of Charleston assigned to regional roadways are displayed in **Exhibit 2-9**. Based on the results of the truck movement highway assignment we conclude that the amount of port-related trucks on the state's highway system does not have a significant impact on total vehicle traffic volumes around the state.

- The highway corridors displaying the majority of long distance Charleston container movements include: I-26 between Charleston and Columbia, US 78/I-20 connecting Charleston and Atlanta and other parts of Georgia, US 17/I-95 connecting Charleston to Savannah and I-16, I-26 routing movements to the Upstate, I-95 connecting I-26 to Fayetteville, NC, and I-77 connecting Columbia and the Charlotte area.

- Based on the traffic assignment, port-related container movements significantly impact neither US highways nor Interstates, but port-related container movements do have a more significant impact on South Carolina's US highways than its Interstate highways. This is derived from the fact that port-related container movements account for a larger percentage of average daily traffic volumes on US highways than on Interstates. On US 78 in Barnwell County, port containers account for 5.97 percent of the average annual daily traffic, and on US highway 17 in Colleton County, port containers account for 4.93 percent of AADT. On I-95 in Jasper County, only 1.25 percent of the daily traffic is Port of Charleston related container movements. Similarly, only 0.05 percent of all traffic on I-85 in Anderson County is Port of Charleston container movements. The most significant location of container movement impact on South Carolina's interstates is on I-26 in Dorchester County, at 4.8 percent of the AADT. Other comparison values are displayed in **Exhibit 2-10** below.



Container Movement Assignments (Daily)

- Less Than 10
- 10 - 100
- 101 - 500
- 501 - 1000
- 1001 - 1500
- More Than 1500

Port of Charleston

Truck Assignments

0 25 50 75 100 Miles

Exhibit 2-9

EXHIBIT 2-10
PORT-RELATED CONTAINER VOLUMES
Selected Locations

Highway	County	AADT	Container Assignment	% of Total AADT
I-95	Clarendon	30,500	270	0.89
I-95	Jasper	42,100	528	1.25
US-78	Barnwell	8,500	507	5.97
US-17	Colleton	13,300	655	4.93
I-26	Dorchester	24,300	1,167	4.80
US-17	Georgetown	23,700	100	0.42
I-385	Laurens	27,300	207	0.76
I-85	Anderson	39,700	18	0.05
I-26	Spartanburg	22,900	292	1.28
I-20	Aiken	24,500	505	2.06
US-176	Union	6,500	159	2.45
I-77	Fairfield	28,800	162	0.56

Source

AADT- SCDOT Year 2000 Average Annual Daily Traffic Data.
Container Assignment – Carrier Survey Data, October 2001.

Traffic Growth

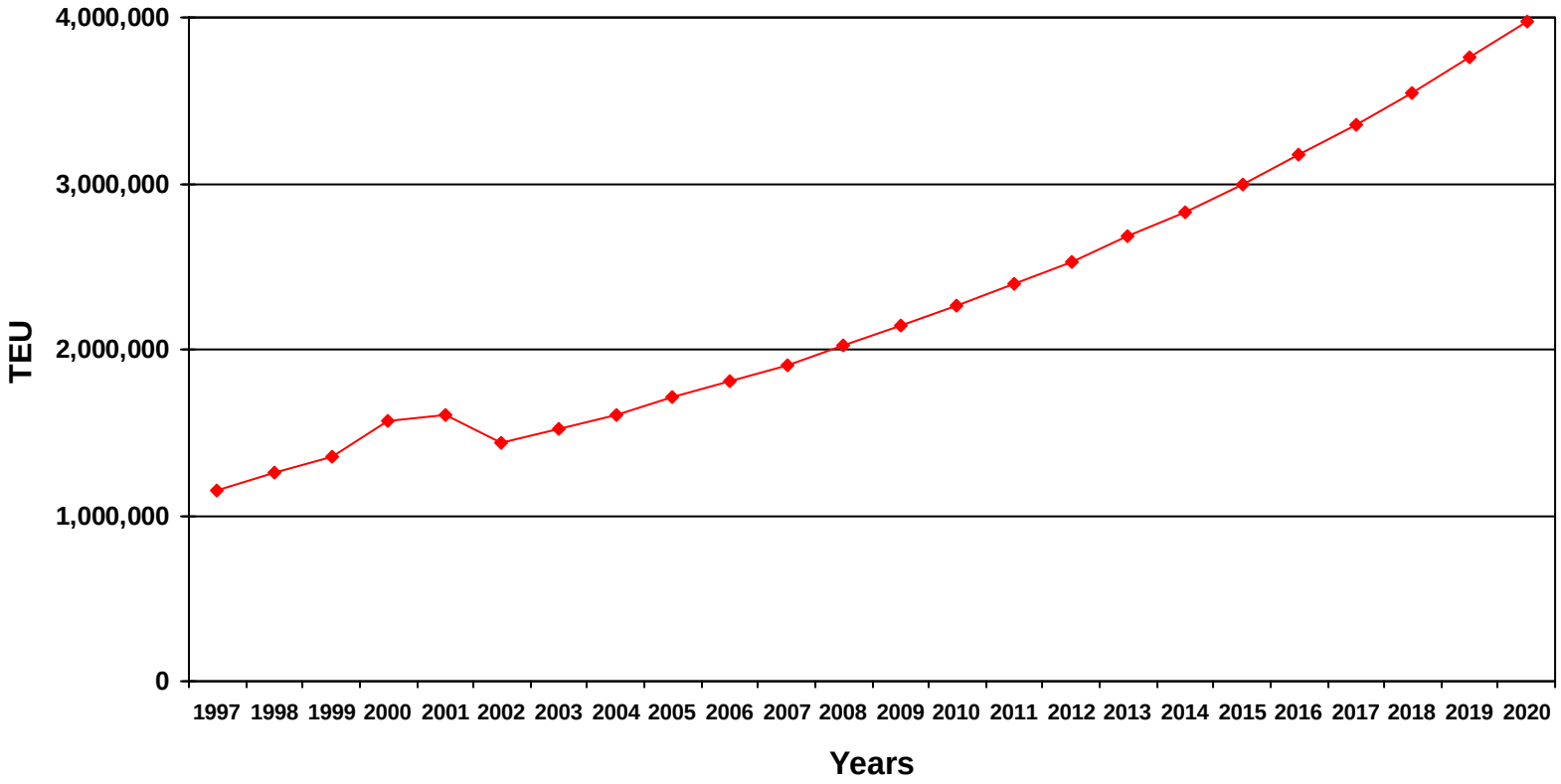
- Planning for the port to date has been based on an annual compound growth rate of 5.8 percent for containers. The recent downturn in the economy has resulted in a 9 to 10 percent reduction in container handling so far in FY 2002. This decrease has broken an unprecedented period of growth which saw the number of TEUs increase by 106 percent since 1990.

- For purposes of this study, it is assumed the decrease continues at the same rate for the remainder of FY 2002, and the previously forecasted growth resumes in 2003. The resulting container traffic projection is shown graphically on **Exhibit 2-11**.

EXHIBIT 2-11

PORT OF CHARLESTON CONTAINER TRAFFIC FORECAST

Using the previously projected annual compared growth rate of 5.8 percent, and assuming the economy recovers in 2002, the Port of Charleston's container traffic would reach 4.0 million TEUs by 2020.



Adapted from *SCSPA Business Plan and Project Feasibility Study,* Mercer Management Company, April 1998.

3

MITIGATION MEASURES

Mitigation Measures

The following discussion relates several possible traffic mitigation measures; the analysis of traffic and motor carrier data provides insights into the relative effectiveness of each.

> Extend Gate Hours at Terminals

– The theory behind this measure is that traffic moving to/from the Port terminals would be distributed over a longer time period resulting in a diluted vehicle flow (fewer "peaks").

– The Port of Charleston completed an initiative in 1998 extending gate hours to run from 7:00 am to 6:00 pm. Prior hours were 8:00 am to noon and 1:00 pm to 5:00 pm. Examination of port-related traffic movements, however, indicates that most movements occur in the nonpeak hours (see **Appendix A**).

> Highway Improvements

– Trucks could be restricted to the right lane(s) of both existing Interstates, both improving safety and traffic flow.

– One potential highway improvement would be to *add capacity to I-526* by adding a third lane in each direction between I-26 and Long Point Road (access road to Wando Welch Terminal). This would involve restriping the elevated portions of the roadway and adding lanes on the nonelevated portions. This alternative would, in part,

play a role in other options. The South Carolina Department of Transportation (SCDOT) has estimated the cost of this alternative at $65 million.

– A second highway improvement would develop *SC-41 from I-526 to US 176 Northwest of Charleston into a "bypass"* route for trucks. While the extension of port terminal gate hours or adding lanes to I-526 would impact all container traffic, the creation of an alternative truck route would hold the most potential for traffic leaving town, some 60 percent of the total. Given that the major future traffic flows will originate from Daniel Island with development of that terminal as proposed and existing traffic problems in Mt. Pleasant, the use of I-526, Clements Ferry Road (SR 33), and various roadways south of Moncks Corner (as shown on **Exhibit 3-1**) returning to I-26 would provide a logical route. The major disadvantage of this route is its circuity as opposed to a I-526/I-26 route, which adds 22 miles and a degradation of operating conditions using a route without access control. The estimated cost (SCDOT) of the SC 41 extension is $306 million.

> Rail Alternatives

There are several ways in which the use of rail transportation can mitigate truck traffic in Charleston, both with and without increasing the percentage of rail shipments.

ALTERNATE TERMINALS AND ROUTES

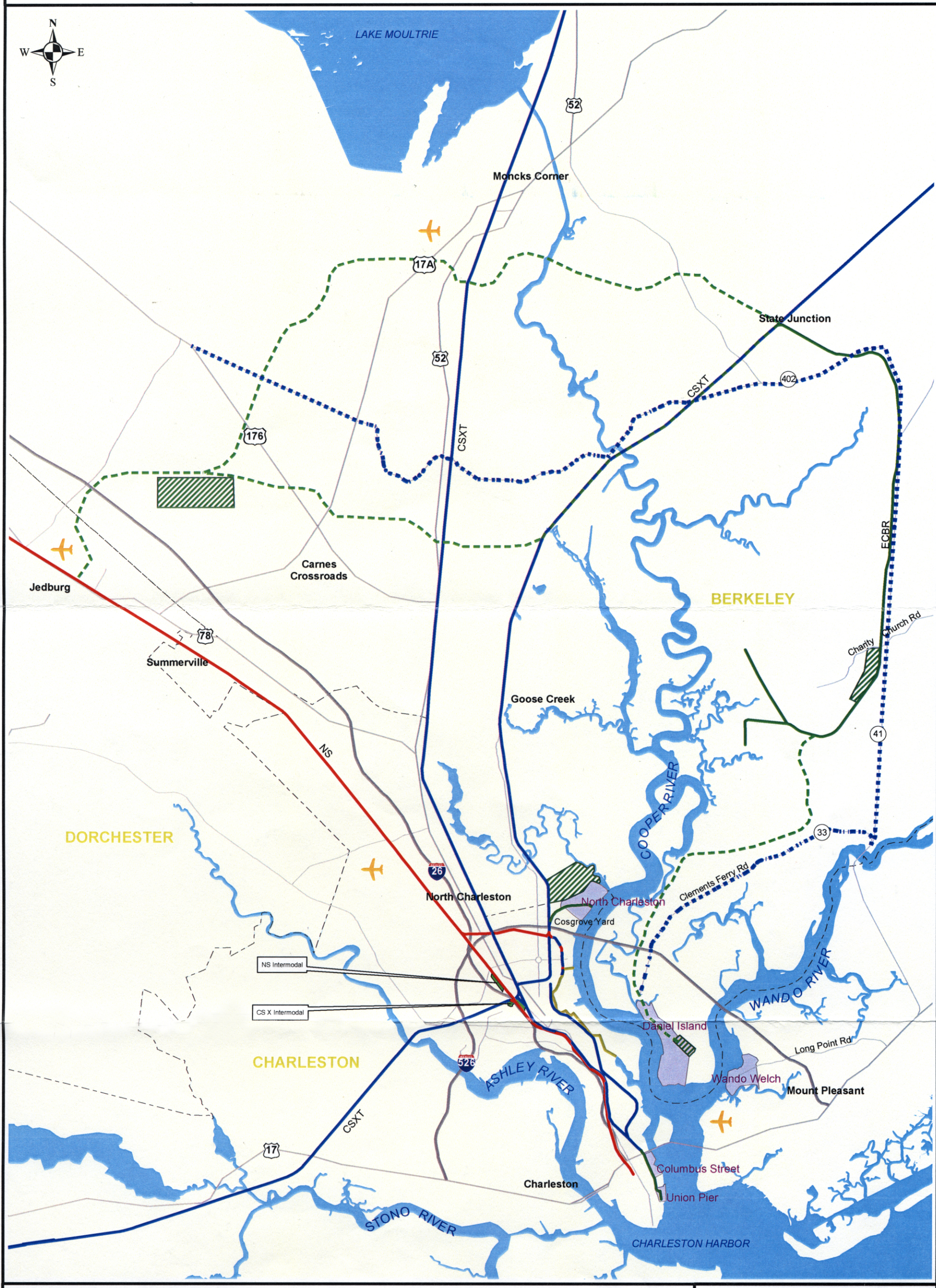


Exhibit 3-1

– *Relocation of existing rail intermodal facilities* (CSX and NS) closer to the ports could impact approximately 25 percent of port terminal gate movements. The closer the rail facilities are located to the marine terminals, the smaller the impact on area roadways. A new terminal is estimated to cost $30 million.

Both of the Southeast's major railroads, CSXT and NS, have intermodal facilities and provide intermodal service in Charleston. The CSX facility (actually CSX Intermodal) is located adjacent to I-26 near Dorchester Road; access is from Meeting Street. Four dedicated intermodal trains run through Charleston and two originate/terminate there (one south to Florida and the other west to Atlanta). Intermodal routes on CSXT are the subject of **Exhibit 3-2**.

The NS facility is located near the CSX facility off Montague Avenue at the railroad's Seven Mile Yard. One dedicated intermodal train a day is run between Charleston and Atlanta. It joins the NS intermodal network at Spartanburg (see **Exhibit 3-3**).

With the proposed expansion on Daniel Island, the new terminal and the nearby Wando Welch Terminal will become the center of container operations. Direct rail service cannot be provided to the Wando Terminal, but can be (and is proposed for) Daniel Island.

– Given the above, the following alternate *rail terminal locations*, shown on Exhibit 3-1, and discussed below, offer potential for mitigating truck movements:

CSX System Intermodal Network

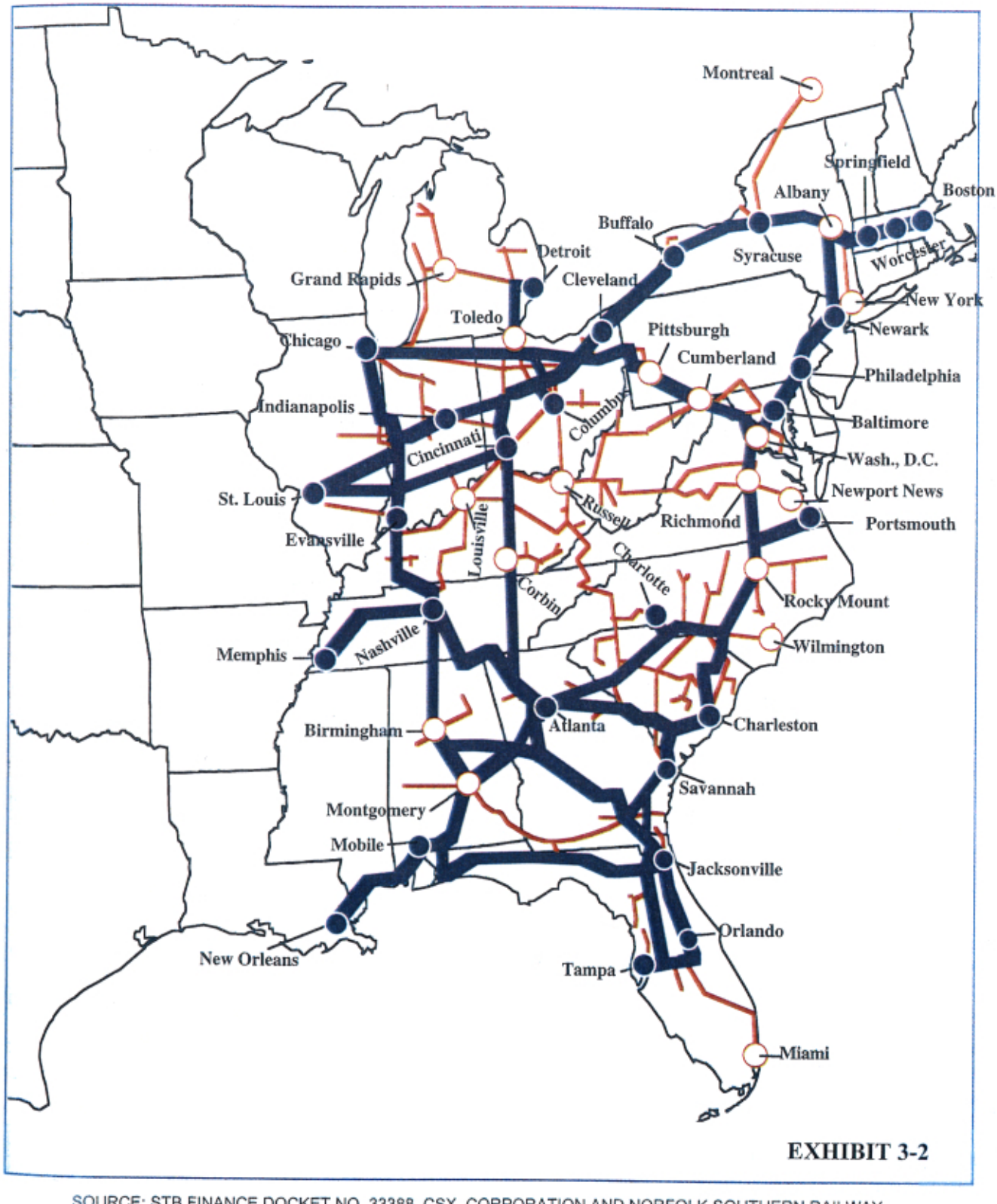


EXHIBIT 3-2

SOURCE: STB FINANCE DOCKET NO. 33388, CSX CORPORATION AND NORFOLK SOUTHERN RAILWAY, RAILROAD CONTROL APPLICATION, VOLUME 3A, JUNE 1997.

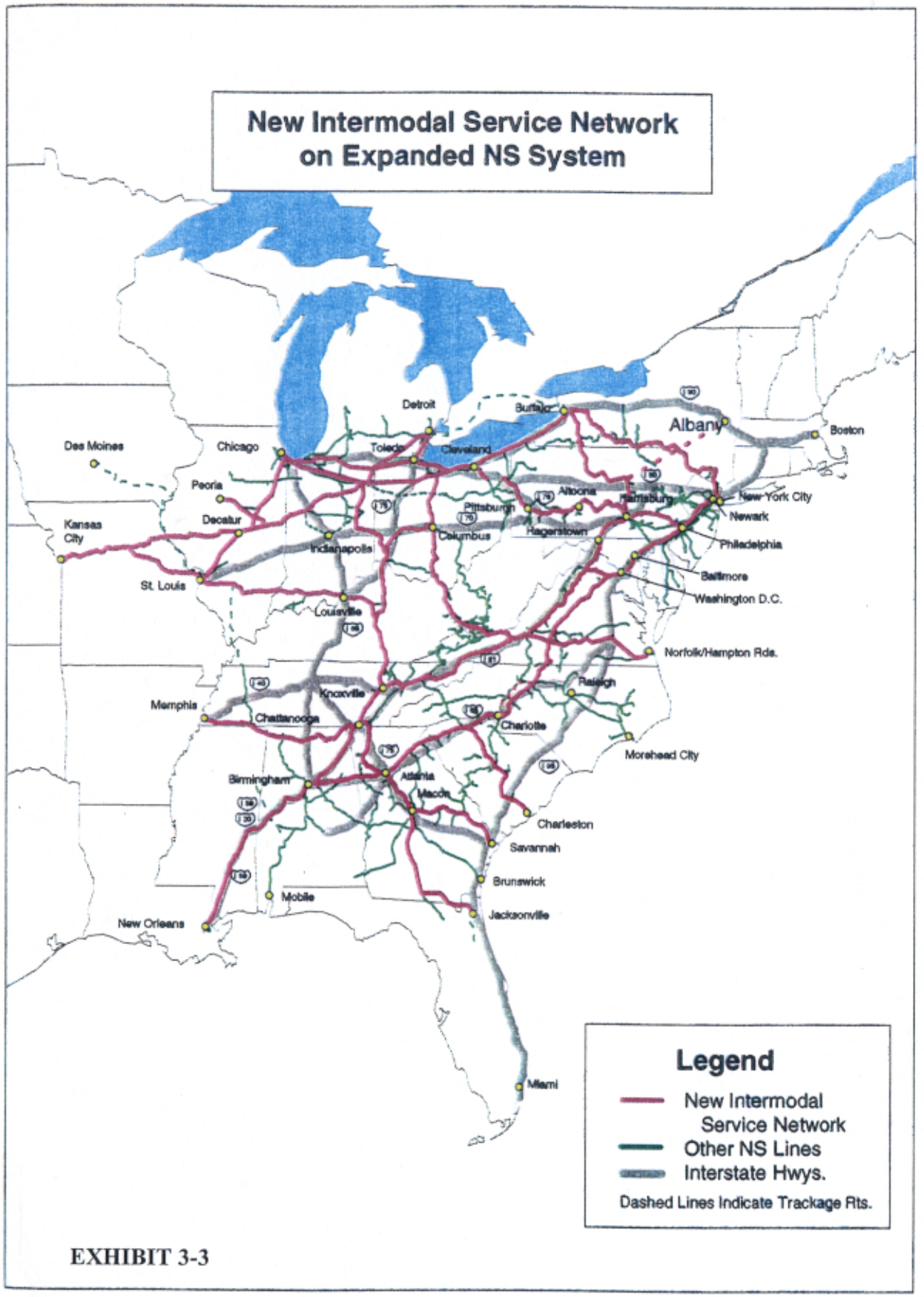


EXHIBIT 3-3

SOURCE: STB FINANCE DOCKET NO. 33388, CSX CORPORATION AND NORFOLK SOUTHERN RAILWAY, RAILROAD CONTROL APPLICATION, VOLUME 3A, JUNE 1997.

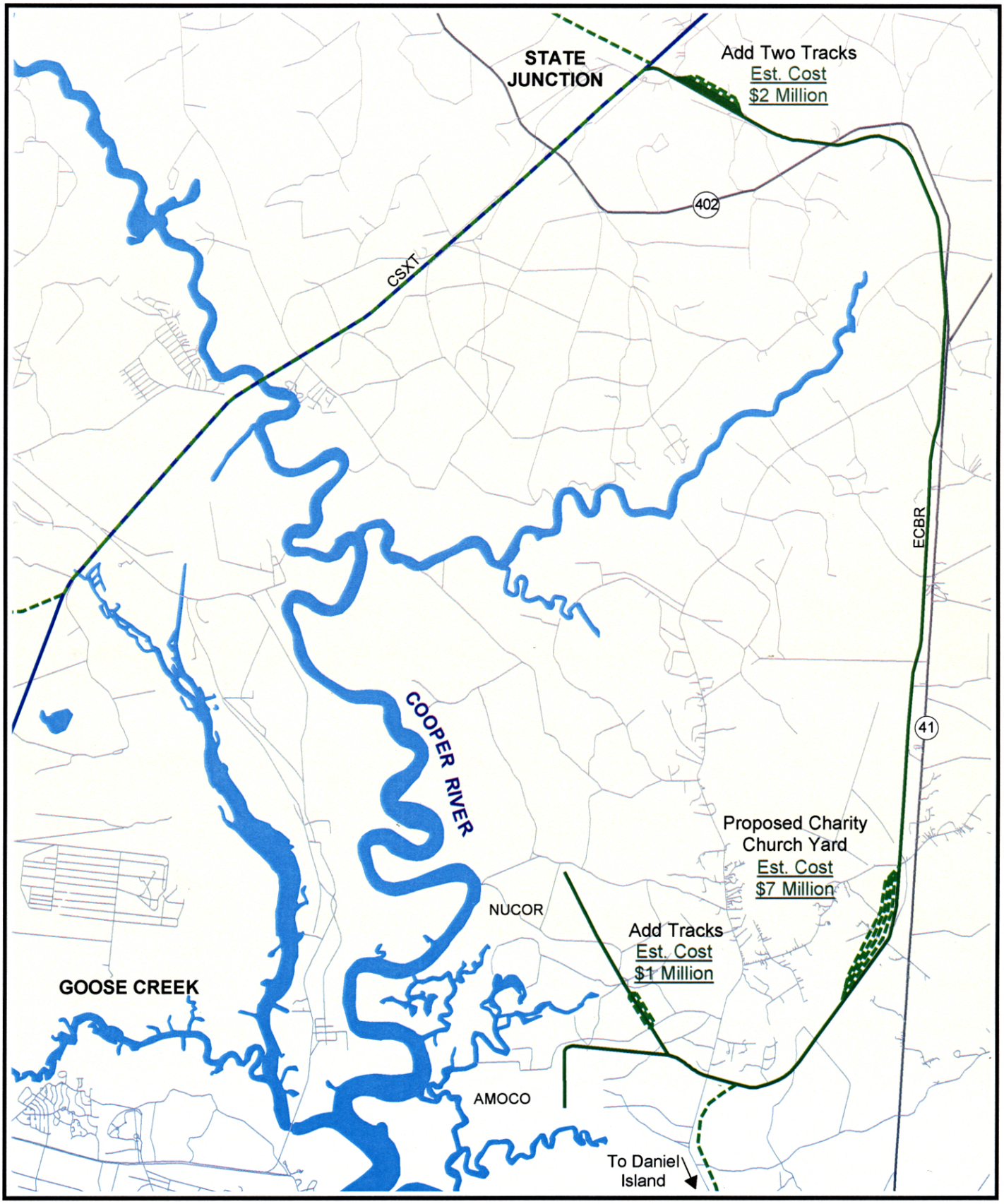
a) An *on-dock rail facility* would nearly eliminate the need for the use of public roadways for the Daniel Island container traffic, and reduce WWT-related trips to I-526 between the two port terminals (Clements Ferry and Long Point Roads). Costs, including the connection from the East Cooper and Berkeley Railroad (ECBR) and improvements to I-526, are estimated at $173 million. Concern expressed over the extension of the rail line from the existing East Cooper and Berkeley Railroad to the proposed Daniel Island terminal expressed during the original EIS process gives weight to other options.

b) *Expansion of the South Annex of the Naval Weapons Station*, also known as and shown on many maps as the US Army Depot, located adjacent to the SCSPA's North Charleston Terminal. A request was made to include this location in the study evaluation. The terminal, connecting track and highway improvements are estimated to cost $78 million. This location offers the potential for expanded port storage capacity but does not reduce truck traffic on I-526 and other area roadways.

c) A *new intermodal terminal* located on SC 41 near Charity Church Road on the South Carolina Public Railway's East Cooper and Berkeley Railroad. This location would require use of public roadways, the most direct route consisting of a portion of the previously discussed alternate route. (Clements Ferry Road to SC 41). Roadway improvements and a terminal are estimated to cost $95 million. (**Exhibit 3-4**).

d) An alternative to a long-haul rail move, one that does not conform to the conventional rail-highway intermodal concept, is to move the traffic by rail from the marine terminal to a *nearby, rural rail facility*, where the containers

EC&B RR IMPROVEMENTS



are transferred back to truck for over-the-road movement. The rail facility could also serve as an alternate location for some port terminal functions, such as container storage. Again, a means to minimize lifts would have to be determined in order to make the alternative viable. A site near Carnes Crossroads would be appropriate. The cost of development including all roadway, rail and terminal costs is estimated to be $235 million (**Exhibit 3-5**).

– *Rail intermodal terminals* can continue to be used as is the current practice, or the roles can be expanded. Expanded use of the rail could consist of:

a) Increased market share of existing rail intermodal movements (e.g., Atlanta, Memphis, Nashville, Chicago, New Orleans). The success of this approach depends on railroad price and service considerations.

b) *Inland Port*. The feasibility of rail intermodal movements are driven principally by volume and distance considerations. Some feasibility "rules of thumb" for an inland port are:

> Origin-destination pair of 25,000 trips annually
> Minimum haul distance of 500 miles, some say 700-850 miles
> Enough traffic to justify a dedicated train

CARNES CROSSROADS INTERMODAL TERMINAL

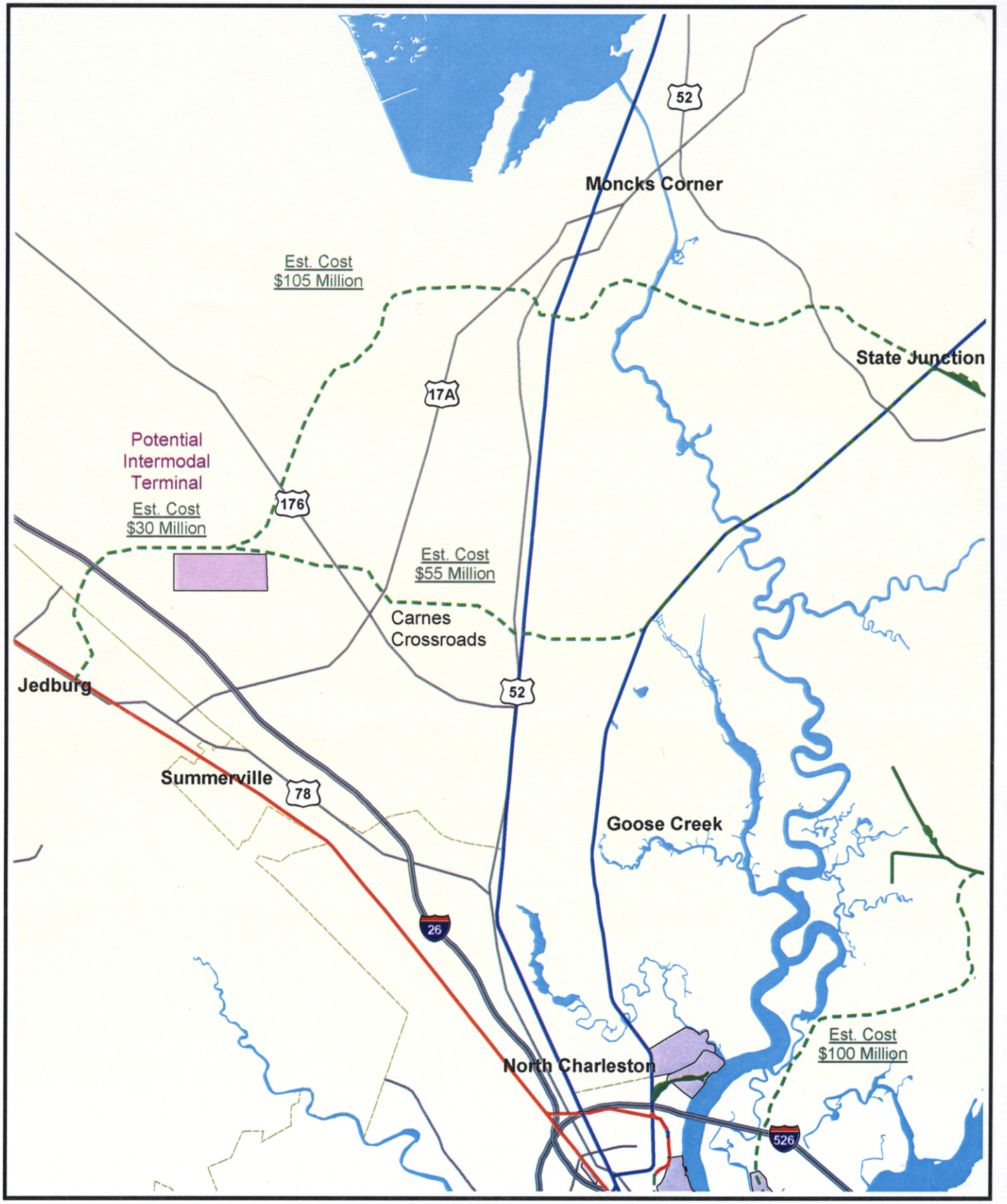


Exhibit 3-5

Examination of the truck survey data reveals that, other than points which already have rail intermodal service to/from Charleston, the Upstate of South Carolina has the highest level of activity. It appears to meet the volume criteria, but the approximate 200-mile distance is woefully short of the "rule-of-thumb" minimums. An NS Charleston–Atlanta intermodal train currently passes through the area and picks up and sets out automobiles and auto rack cars at Spartanburg. The short haul would have to be overcome, however, most probably by finding a way to reduce the number of lifts associated with the movement. The Upstate has had rail intermodal service in the past – an NS facility at Greenville just recently closed, and an "inland port" facility of the SCSPA. The "inland port" facility, located at Greer, was unsuccessful and short-lived. An intermodal terminal in the Upstate would cost approximately $30 million.

> Inland Port

- Container activity forecast for the Port of Charleston (Exhibit 2-9) shows an approximate demand of 4 million TEUs by 2020. If this projected growth is to be accommodated, additional port capacity (such as that proposed for Daniel Island) *will be required*. In addition to terminal improvements, adequate facilities must be provided for the staging of departing and/or arriving containers.

- For a number of reasons, the port capacity required to address future freight traffic at the Port of Charleston may not be realized. However, development of an inland port could also relieve freight congestion at Charleston. Such a facility would serve as an intermediate point for container staging activities, either en route to or from the Port of

Charleston via truck, rail or a combination of both. It is understood that any improvement in Port operations will, to some degree, positively impact the Charleston area's roadway network.

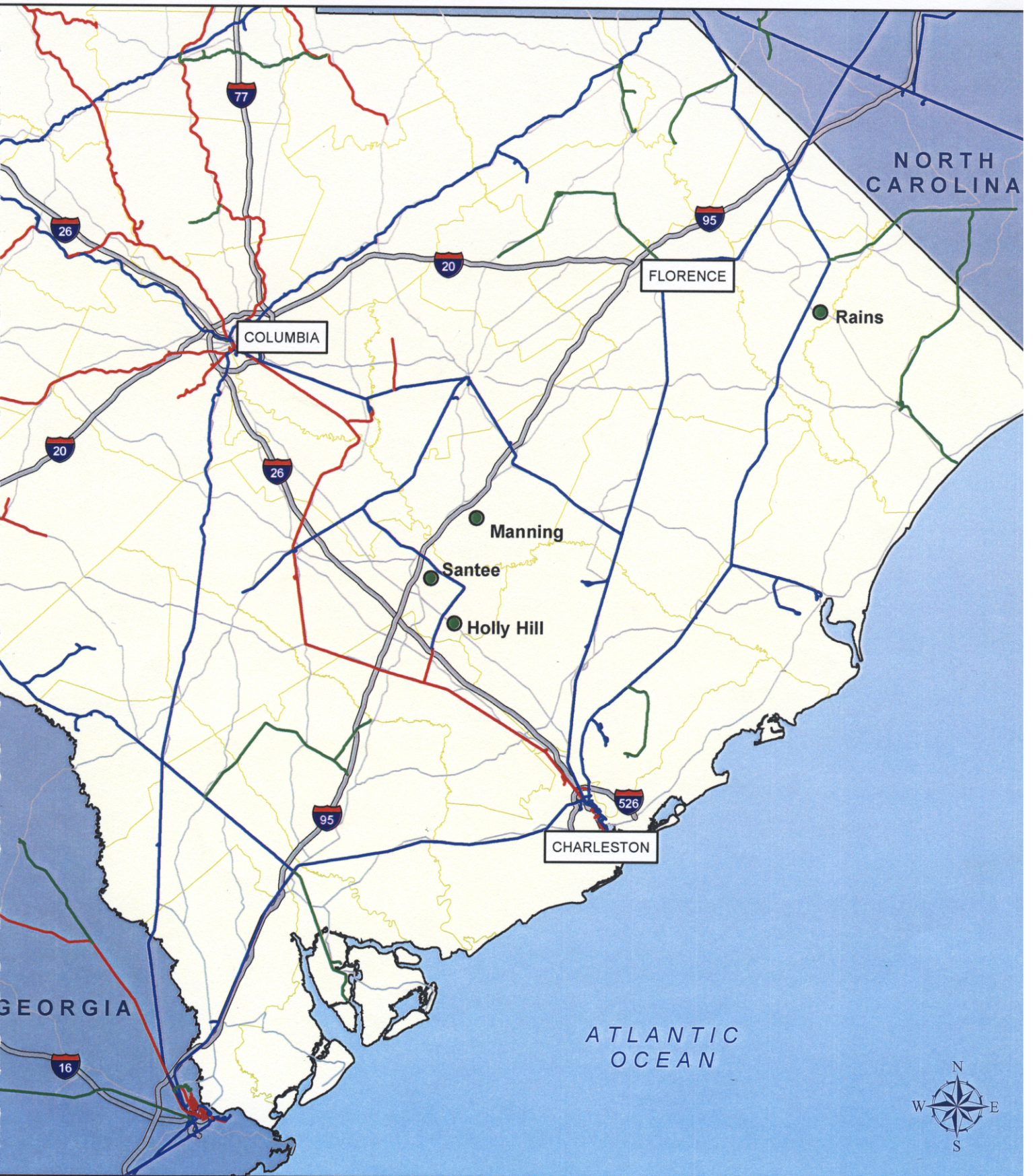
In addition to the feasibility rules mentioned previously, siting an inland port must maximize access to existing railroads and truck routes. An inland port serving Charleston port traffic should have proximate, direct access to both the NS and CSXT intermodal mainlines, as well as nearby access to the Interstate system, and a rail connection to the Charleston terminals. Other attributes are equally important, such as availability of affordable land, minimal environmental impacts, nearby labor pool. The location's viability is also affected by how container handling can be minimized, travel time from dock to main transport network (truck or rail) is optimized, and overall capital/operating costs make the option attractive to the port terminals, shippers, customers, and public.

The following proposals for siting an inland port were reviewed (see **Exhibit 3-6**):

a) Santee. A proposed inland port site has been suggested on SC Route 6 near Santee in Orangeburg County. This location offers the following positive attributes:

- Excellent highway access (I-95)
- Located on a CSX branchline
- NS branchline nearby (<15 miles)
- Nearby labor from Orangeburg and other communities
- Excellent connection to I-26

Potential Inland Port Locations



Railroads
- CSXT
- NS
- SCPR

Site Locations
- Interstate
- US Highway
- County

0 20 40 60 80 Miles

Exhibit 3-6

However, the location has several disadvantages, including:

- It is not located on or near the intermodal mainline of either railroad
- There appears to be substantial wetland involvement
- Site is near Lake Marion recreational areas
- Opposition has surfaced from retired citizens living in and around Santee

b) Holly Hill. A second Orangeburg County site is located on SC Route 453 midway between Holly Hill and I-26. Its positives include:

- Excellent connection to I-26
- Excellent nearby access to I-95
- Located on a CSX branchline
- Located very near an NS branchline and the NS Intermodal mainline
- Availability of labor in Orangeburg and other communities
- No apparent environmental involvement
- No public opposition

The Holly Hill site has some negatives, including:

- Poor connection to the CSXT Intermodal mainline
- I-26 connection via SC 453 is two-laned

c) Manning. A third inland port location alternative is in Clarendon County, south of I-95 near Manning. Attributes of this location include:

- Excellent access to I-95
- Located on a CSX branchline
- Nearby labor from Manning, Sumter and other communities
- No apparent public opposition.

However, the Manning location does not have good access to either I-26 or the NS Intermodal mainline and is near sensitive wildlife refuges on the north side of Lake Marion.

d) Rains. An inland port location in Marion County near Rains, SC has also been suggested. This site's advantages are its location on a CSX branchline and availability of labor from nearby communities. The quality of Its highway access (US 501) is good, but US 501 is often congested and I-95/20 is some 30 miles away. Other negatives include no access to the NS system, long distance from I-26, and possibility of public opposition from the tourist industry and retired citizens.

- The concept of an inland port is indeed worthwhile to consider; under the right circumstances an inland port facility can be advantageous in removing truck traffic from roadways in and around a port like Charleston. In this instance, none of the suggested inland port locations are ideal, and all are located too close to Charleston to be economically attractive to the railroads.

- In order for the inland port concept to be applied to the Charleston Port, it appears substantial public subsidies are mandatory. Public finances/subsidy would be required to provide the infrastructure (inland port, land acquisition, rail connections, internal roadways) and likely be needed to support operations costs. Obviously, involvement by the truckers, railroads, customers, port terminals and others could affect the financial formula.

4

INLAND PORT TERMINALS

Inland Port Terminals – Other States' Experience

At present, neighboring states are utilizing inland port terminals, still other states are developing plans to do so.

Virginia Inland Port

Located between Winchester and Front Royal, Virginia, the Virginia Inland Port (VIP)[i] was built to increase business at the Hampton Roads terminals of the Virginia Port Authority (VPA). The inland port is located 220 miles northwest of the marine terminals at Hampton Roads. It has easy access to Interstate routes 66 and 81 providing both east-west and north-south access. Rail service from Norfolk Southern Railway (NS) is also available at the site, and the VPA and NS initially instituted a triweekly train between the inland terminal and Hampton Roads.

Originally intended to attract business from the Ohio Valley region which was using the Port of Baltimore, the terminal's focus is now on local industries. The terminal is also used for domestic service by NS. It not only provides transfers of containers between rail and truck, but it has warehousing and maintenance facilities, provisions for container storage, USDA inspectors are available, and it is a U.S. Customs-designated port of entry.

Rail facilities can handle 75 cars of 89-foot length, 625 wheeled units and 200 stacked containers. Service is currently provided between VIP and Hampton Roads four days per week by NS. Approximately 20,000 lifts were performed in 1999 at Front Royal.

North Carolina Ports Inland Terminals

The inland terminals of the North Carolina State Ports Authority[ii] are located in Charlotte and Greensboro. Neither facility is directly rail served but both have access to railroad intermodal facilities at each location (Charlotte, CSXI and NS and Greensboro, NS). The inland terminals are approximately 200 miles from the marine container terminal at Wilmington, 203 and 184 miles from Charlotte and Greensboro, respectively.

The principal functions of the terminals are to match movements to and from the marine terminal to minimize deadheading and transportation costs, and to make it easier for customers to pick up and deliver containers. The terminals provide a ready supply of empty boxes for local needs.

Port Inland Distribution Network

The Port Authority of New York and New Jersey is planning to combat terminal space shortage and traffic problems through the development of its Port Inland Distribution Network (PIDN). The lack of available deep water land and the expense of development for terminal space led the Port Authority to look at "maximizing the capacity of existing terminals by reducing dwell time through transshipping containers by barge and rail, thereby taking demand off trucks and getting faster turns in container yards".[iii] This strategy is driven by several factors:

- Typical dwell time[iv] for containers to be trucked is 6 to 8 days at the port.
- Typical dwell time for loaded containers being moved from on-dock rail facilities is one to two days.

- Empty containers can remain in the terminal for 30 days or more.
- Eighty-six percent of the port's cargo is moved by truck.
- The ports hinterland is a 14-state region within a 400-mile radius of the port, with 60 percent of the containers traveling beyond 75 miles.

A number of inland waterway ports and rail terminals have been identified for "feeder" ports, as close as Camden, NJ and Albany, NY (water), and as far away as Buffalo and Pittsburgh (rail, 396 and 439 miles, respectively), and negotiations are underway with several. While the cost of rail and barge line-haul transportation is likely to be less than for trucks, the extra handling in terms of lifts on and off rail and water equipment is a problem.

It is important to note that the operations of each of the active inland ports discussed above are subsidized to some degree. Reasons for this include:

- The short distance moved by rail to generate a return for the rail lines.
- Container ship and trucking industries do not like paying for storage of their containers in an intermediate facility.
- The extra handling time associated with using of an intermediate facility increases the cost of the overall movement.
- Rail lines have to incur the cost of moving freight from an intermediate facility to their rail terminals, which may not be located near the intermediate facility. In such cases, rail lines may be required to make investments in moving terminal operations to a site nearer the intermediate facility.

[i] This discussion is based on information contained in the websites of Norfolk Southern Railway and the Virginia Port Authority, and *Virginia Inland Port, the Case for Moving a Marine Terminal to an Inland Location*, by J. Robert Bray, Executive Director VPA, prepared for the American Association of Port Authorities Professional Port Manager Program, September, 1996.

[ii] Data obtained from promotional material produced by the North Carolina State Ports Authority and conversations with NCSPA and North Carolina DOT personnel.

[iii] William Ellis, NYNJPA, quoted in *American Shipper*, June 2001, p. 72.

[iv] The time a container is in the marine terminal, e.g., from the time it is taken off a ship until it leaves the terminal.

5

IMPACT ANALYSIS

Analysis Methodology

- As the focus of this investigation was to identify ways to mitigate the impact of additional containers on area highways, the principal analysis tool was the Federal Highway Administration's Highway Economic Requirements System (HERS). HERS is a comprehensive highway performance model used to develop information for Congress. Output from HERS is used in preparing the U.S. Department of Transportation's biennial report to Congress on the "Status of the Nation's Surface Transportation System."

- The HERS methodology is an economic analysis which uses projected highway operating conditions (as defined by volume-to-capacity ratio, pavement condition, and other factors), accident occurrence, environmental factors and maintenance needs to estimate user and agency costs and benefits, and determine future improvement needs.

- HERS uses the Highway Performance Monitoring System (HPMS) database, which is a stratified random sample of a state's highway system. Each state transportation department collects traffic, pavement, ride quality, and other highway data needed to update the database each year. FHWA uses data from all states to develop reports for Congress. However, HERS can be applied to an individual state's database to produce specific state reports. Charleston Area HPMS files were provided by SCDOT to the consultant for analysis purposes.

- HERS reports show vehicle-miles of travel, average speed, hours of congestion delay, crashes, fatalities, injuries, and unit costs of highway travel. HERS performs many highway capacity calculations using factors from the 1997 Highway Capacity Manual. It evaluates the AADT, v/c ratio, theoretical peak capacity, percent trucks, pavement serviceability

rating (PSR), and other highway or travel conditions that affect highway user costs. These evaluations are performed for each sample highway section in the HPMS database. Using this information, HERS estimates a set of unit costs per thousand vehicle-miles of travel for the three cost categories mentioned earlier: vehicle-operating costs, travel-time costs, and safety costs.

> The HERS procedures are used to define the differences in the evaluation parameters due to changes in highway flows based on the incremental traffic resulting from implementation of the various alternatives. The incremental traffic is that which would move by other means, such as an alternate roadway or mode of transportation.

> A benefit-cost analysis is then performed to determine the value of each alternative. Capital and operating costs are developed and the resulting changes in highway element costs as measured by HERS become the benefits or disbenefits as the case may be. The analyses are conducted through the year 2020, the highway volume forecast year in the HPMS.

Alternatives Analyzed

> The base case, against which all alternatives were measured, assumed that no port expansion would occur other than that planned for existing terminals. For I-526, this meant that roadway traffic resulting from port growth ceased in 2009 after the Wando Welch Terminal (WWT) would be fully built out.

- **Scenario 1** assumed that the Daniel Island Terminal was constructed on schedule and all terminal activity grew as forecasted. All containers moved over the existing highway system with Daniel Island traffic entering the system at the Clements Ferry Road interchange with I-526.

- **Scenario 1A** assumed that an on-dock rail intermodal facility was built at the Daniel Island terminal and that 25 percent of that terminal's activity, as well as WWT's, moved through this facility. The on-dock facility was connected with the ECBR's existing line. Containers to/from WWT still had to use I-526 between Clements Ferry Road and Long Point Road.

- **Scenario 2** used the same basic assumption as Scenario 1A, but the terminal was located on the ECBR near Charity Church Road. All containers were drayed to the facility using Clements Ferry Road and SC 41.

- **Scenario 3** built on previous scenarios by assuming an inland intermodal staging facility was constructed in the Upstate, and that another 5 percent of the traffic from the two terminals was converted to rail. The rail move would be from the Daniel Island on-dock (Scenario 1A) or Charity Church Road (Scenario 2) facility.

- **Scenario 4** builds on 2 and 3. In this case, a new rail line was constructed between the existing rail system (Exhibit 3-1) and Jedburg, while an intermodal facility was constructed near Carnes Crossroads. Under this scenario, another 30 percent of the Daniel Island and WWT containers were added to the Scenario 3, volume equating to a total of 60 percent.

The additional volume was derived from out-of-town truck traffic. Only half of the total volume would continue by rail, the remainder would be grounded and forwarded by truck (or the reverse). The rail move for this segment of containers served to remove container traffic from the urban area network along with its associated impacts. The terminal location would provide access within a short distance to I-26 and the intermodal facilities of both railroads (some other sites suggested were far removed from the intermodal facilities of both railroads).

- **Scenario 5** made use of a rail intermodal facility at the US Army Depot adjacent to the NCT. In this case, containers were drayed from WWT and Daniel Island for rail movement. Only the normal rail intermodal share and the potential Upstate inland terminal share moved out by rail. Containers from Daniel Island and WWT would have to use the segment of I-526 between Long Point Road and Rhett Avenue to reach the terminal.

HERS Analysis Results

The primary objective of this analysis was to determine if the diversion of port-related truck traffic from I-526 would impact the need for improvements to the highway and, if so, to what extent. The initial approach for this determination was to analyze traffic on I-526 using HERS to determine the relative level of user, maintenance, accident, and pollution "operating" costs considering the 5.8 percent growth rate for port-related traffic, and the HPMS growth rate for the remainder of the traffic stream (approximately 3 percent annual compounded, which is comparable with SCDOT's default of value of 3 percent for urban interstates based on prior experience). The results considering the various scenarios are the subject of **Exhibit 5-1**.

Exhibit 5-1

I-526 PORT EXPANSION ANALYSIS

SCENARIO COST COMPARISON

Annual Operating Costs
($ million)

Year	No Port Expansion	Port Expansion at DIT	Rail Intermodal Facility on Daniel Island			Rail Intermodal Facility at NCT	
			25% Rail Diversion	30% Rail Diversion	60% Rail Diversion	25% Rail Diversion	30% Rail Diversion
2001	115.4	-	-	-	-	-	-
2005	127.1	-	-	-	-	-	-
2009	146.2	146.2	-	-	-	-	-
2012	159.1	161.5	158.9	158.5	151.9	158.1	157.7
2015	174.9	180.5	175.9	175.5	167.4	176.9	176.2
2020	206.8	225.4	215.9	213.6	198.1	217.9	216.9

Source: Wilbur Smith Associates and Denver Tolliver and Associates.

> Exhibit 5-1 reveals that with no port expansion (other than planned improvements at existing container terminals), the operating costs associated with the use of I-526 between Long Point Road and I-26 would increase $91.4 million (79 percent) between the base year of 2001 and the forecast year of 2020, almost doubling. Port expansion on Daniel Island, opening in 2009, with all terminal traffic using I-526, increases costs to $225.4 million in 2020, or $18.6 million (9 percent) more than with no port expansion.

If an alternate highway was built and all of the port-related traffic removed from I-526 except that portion from Wando Terminal, which would have to remain on part of I-526 to reach the new roadway, the cost difference would be virtually the same as those just discussed (the difference in expansion on Daniel Island versus no expansion, $18.6 million in 2020).

> The various rail alternatives offer some relief (measured as the difference in costs associated with port expansion on Daniel Island and the specific rail alternative). These differences range from $27.3 million (12 percent) for a 60 percent diversion for an on-dock facility to $7.5 million (4 percent) for a 25 percent diversion from a terminal at the US Army Depot in the forecast year of 2020. The differences in the intervening years between 2009 and 2020 are smaller sums, as the traffic volumes are less.

> The HERS can also compute the need for capacity expansion based on roadway conditions and associated costs if the capacity is not constrained as done initially. It computes widening and resurfacing needs and associated costs over time, and uses the values in an internal benefit-cost ratio. Based on the HERS runs, a “need” for improvements to the existing roadway and the addition of 38 lane miles roughly the equivalent of two additional lanes in each

direction, is attained in the funding period between 2014 and 2019 (HERS uses five-year periods). The timing is based on a benefit-cost ratio threshold of 2.0. This value was used in lieu of 1.0 to eliminate early additions when the traditional threshold was barely exceeded.

The HERS analysis, however, assumes an ideal situation: no funding constraints and improvements are made as soon as justified by its internal benefit-cost analysis. In addition, the HERS analysis considers resurfacing needs while looking ahead at capacity needs. In this process it evaluates and implements the most cost-effective combination of resurfacing and lane additions. In this manner needs are determined at a faster rate than a pure engineering capacity analysis would indicate. In addition, practical considerations such as the lead time for all of the steps in actual project implementation, including funding, may not permit completion of such an idealistic schedule.

> Given the preceding, one additional lane would most likely be added in the prior funding period or just after the terminal on Daniel Island would open. In the specific case of I-526, the addition of one extra lane in each direction is a totally different situation than the addition of two. The first can be accomplished largely within the existing infrastructure as discussed earlier. The second lane, however, will require new structures or additions to existing structures for about two-thirds of the distance between Long Point Road and I-26, including those over the Cooper and Wando Rivers. The second additional lane would not be needed for at least five years beyond the first. Based on an extension of the HERS analysis, no additional improvements would be required through 2030 assuming the same traffic growth rates continue.

Implementation of the rail improvements has little impact on the HERS improvement analysis. Even with a 60 percent reduction in port-related traffic highway, capacity needs are only reduced by six lane miles. This indicates that capacity needs are driven by overall traffic growth, not port-related traffic.

Benefit-Cost Analysis

The benefit-cost analysis is conducted as a present value analysis. The approach recognizes that a dollar at some future date is not worth what it is today. All values are expressed in terms of constant dollars (2001) and appear in the analysis over time in the year that they occur.

- The analysis period is the same as the project analysis, 19 years. The 20 years run from 2001 (the date of most of the base data) to 2020 (the date of the forecast data).

- All values are discounted at an annual rate of 5.0 percent. This is the rate used by the South Carolina Department of Transportation, and represents the cost of capital for the Department.

- The alternative providing the greatest level of benefits, the 60 percent diversion with the terminal at Jedburg, produces a benefit present value of $75 million between 2010 and 2020. These benefits are applicable only if highway capacity is not increased. Once capacity is added, the benefits disappear as traffic movement improves. The capital costs associated with that alternative, however, are $235 million, which ignores increased rail operating costs. The other rail alternatives do not fare much better.

Analysis Summary

There are insufficient benefits developed from any of the rail alternatives to justify their implementation to reduce traffic levels on I-526, nor do any of them divert enough traffic to delay capacity improvement needs on I-526, even with up to 60 percent of port-related traffic diverted. These analyses confirm that traffic volumes on I-526 are not materially impacted by port traffic.

6

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

- Port-related highway traffic has the greatest concentrations in the Charleston area on I-526, between I-26 and Long Point Road, accounting for 7.6 percent of the total volume at the Cooper River Bridge. This section of roadway would also be the most heavily impacted with port expansion on Daniel Island. The next largest volumes are found on I-26 north of I-526, but because of the high level of automobile and other truck traffic, port traffic accounts for only 3.2 percent of the total at I-26 and Ashley Phosphate Road. Thus, traffic volumes are impacted little by port-related traffic.

- Approximately 25 percent of containers move between their original origin and final destination and Charleston by rail. The relative short distances the remaining traffic (89 percent within 500 miles) moves by truck, and the multiple origins and destinations would tend to make further conversion to long-haul rail use in any significant volume difficult. Potential does exist in some areas of origin-destination concentration but costs would have to be controlled.

- Although most, 84 percent, of the container traffic moving through the Port of Charleston has origins and destinations outside of the immediate area, some 50 to 60 percent of that amount have intermediate stops in the area - - at rail intermodal facilities, truck yards or warehouses. Thus the local roadway system remains important for container movement.

- Construction and operation of an inland port located outside Charleston would require public subsidy, and the concept's economic feasibility is questionable for the sites evaluated.

- Based on the HERS analysis, capacity expansions will be needed on I-526 within 10-12 years, followed by additional needs not far behind.

- Again, based on the HERS analysis, the diversion of port-related traffic has little impact on I-526 capacity needs. This conclusion is further evidence that non-port-related traffic is propelling traffic volumes and associated impacts.

- Just because rail alternatives do not effectively reduce I-526 traffic impacts, that does not mean that rail access is not needed to satisfy port transportation needs, especially if the port becomes a load center and its hinterland expands.

  On-dock rail would be the most effective improvement from both commercial and roadway traffic standpoints. Locations on the East Cooper and Berkeley Railroad near Charity Church Road and the U.S. Army Depot offer nearby sites, but still require a dray over public roads, one over I-526 and the other over Clements Ferry Road. The U.S. Army Depot site reduces the rail move dramatically and presents less institutional problems with individual railroad access, but its availability is questionable and it does not significantly reduce the dray distance vis-à-vis the existing rail terminals (4-5 miles). It would be more strongly considered if one or both of the trunk line railroads' existing intermodal facility was becoming capacity constrained.

Recommendations

- Based on expected highway growth, additional capacity on I-526 will be needed. Additional study to develop the highway alternative to add a third lane in each direction on I-526, as developed by the SCDOT and described in this report, is recommended.

- Because of the type of construction prevalent on I-526, investigate optional highway solutions to expansion of I-526 beyond the third lane proposed to move traffic between Mount Pleasant and I-26. An alternative roadway using SC 41 and SC 402 and running just south of Moncks Corner would provide a starting point. More study is needed on specific alignments to determine costs and benefits.

- Continue pursuit of rail service options for Daniel Island for long-term needs based on the availability of rights-of-way and facility sites.

- Implementation of a “freight friendly” planning approach in Charleston (and other locales) would focus planning resources on a process that considers transportation needs for passengers as well as freight. This approach would help identify critical issues early and expedite the implementation of actions t hat benefit all stakeholders.

APPENDIX A

CITY Charleston, SC LOCATION Camera 029 I 526 W Don Holt Down

DATE 2/28/02 DAY OF WEEK Thursday

		Containers		Empty Containers		Bob-Tails		Non Containers		Total	Port Related
TIME PERIOD		IN-EB	OUT-WB	IN-EB	OUT-WB	IN-EB	OUT-WB	IN-EB	OUT-WB		
7:00	8:00	99	40	1	0 3	30	32	64	38	307	205
8:00	9:00	151	75	2	1	30	22	67	55	403	281
9:00	10:00	147	161	0	2	36	52	60	84	542	398
10:00	11:00	182	135	4	0	29	37	76	97	560	387
11:00	12:00	145	113	2	16	17	31	83	65	472	324
12:00	1:00	139	104	0	16	22	22	61	56	420	303
1:00	2:00	121	121	0	10	34	36	98	64	484	322
2:00	3:00	140	147	0	4	40	37	99	86	553	368
3:00	4:00	144	136	3	1	43	29	92	73	521	356
4:00	5:00	69	101	0	5	17	34	34	26	286	226
5:00	6:00	43	76	1	10	16	30	29	60	265	176
6:00	7:00	25	28	0	3	6	8	14	40	124	70
Totals		1405	1237	13	71	320	370	777	744	4937	3416
In/Out Combined		2642		84		690		1521			
Percentage		54%		2%		14%		31%			69%

CITY Charleston, SC LOCATION Camera 029 I 526 W Don Holt Down

DATE 3/1/02 DAY OF WEEK Friday

		Containers		Empty Containers		Bob-Tails		Non Container		Total	Port Related
TIME PERIOD		IN-EB	OUT-WB	IN-EB	OUT-WB	IN-EB	OUT-WB	IN-EB	OUT-WB		
7:00	8:00	30	12	0	0 1	10	5	24	5	87	58
8:00	9:00	101	23	3	2	18	12	67	33	259	159
9:00	10:00	171	129	26	6	43	37	41	84	537	412
10:00	11:00	167	162	33	9	37	22	29	28	556	430
11:00	12:00	158	162	3	12	23	39	71	74	542	397
12:00	1:00	139	108	1	8	28	37	56	64	441	321
1:00	2:00	154	135	1	12	40	35	45	52	474	377
2:00	3:00	110	175	11	11	43	57	45	60	512	407
3:00	4:00	138	121	0	1	54	30	41	55	440	344
4:00	5:00	80	96	0	4	30	28	26	22	286	238
5:00	6:00	72	31	3	0	38	17	23	22	206	161
6:00	7:00	16	10	1	0	7	1	7	9	51	35
Total		1336	1164	82	66	371	320	475	508	4391	3339
In/Out Combined		2500		148		691		983			
Percentage		57%		3%		16%		22%			76%

CITY Charleston, SC LOCATION I 26 north of I 526

DATE 2/28/02 DAY OF WEEK Thursday

		Containers		Empty Containers		Bob-Tails		Non Containers		Total	Port Related
TIME PERIOD		IN-NB	OUT-SB	IN-NB	OUT-SB	IN-NB	OUT-SB	IN-NB	OUT-SB		
7:00	8:00	23	45	5	0 14	12	29	153	221	502	128
8:00	9:00	41	67	16	17	13	22	209	263	648	176
9:00	10:00	78	91	19	24	13	16	225	274	740	241
10:00	11:00	77	94	11	28	15	12	242	28	710	237
11:00	12:00	75	86	5	9	12	13	223	220	643	200
12:00	1:00	61	133	3	1	14	12	131	171	526	224
1:00	2:00	61	113	1	4	13	16	123	162	493	208
2:00	3:00	90	104	4	5	29	15	166	142	555	247
3:00	4:00	95	95	3	2	24	14	139	118	490	233
4:00	5:00	90	58	8	3	38	15	119	81	412	212
5:00	6:00	82	49	3	0	29	8	95	79	345	171
6:00	7:00	19	12	2	0	8	1	25	16	83	42
Total		792	947	80	107	220	173	1850	1775	6147	2319
In/Out Combined		1739		187		393		3625			
Percentage		28%		3%		6%		59%			38%

CITY Charleston, SC LOCATION I 26 north of I 526

DATE 3/1/02 DAY OF WEEK Friday

		Containers		Empty Containers		Bob-Tails		Non Containers		Total	Port Related
TIME PERIOD		IN-NB	OUT-SB	IN-NB	OUT-SB	IN-NB	OUT-SB	IN-NB	OUT-SB		
7:00	8:00	17	42	2	0 9	5	29	88	127	319	104
8:00	9:00	36	81	0	1	19	22	117	135	411	159
9:00	10:00	64	81	3	1	10	13	134	145	451	172
10:00	11:00	98	85	2	1	15	20	142	28	506	221
11:00	12:00	80	99	0	0	12	14	146	139	490	205
12:00	1:00	56	121	4	0	16	10	133	150	490	207
1:00	2:00	75	95	0	1	28	22	102	126	449	221
2:00	3:00	77	120	0	1	35	18	128	106	493	251
3:00	4:00	83	89	3	2	28	24	101	101	432	229
4:00	5:00	60	53	0	2	31	12	86	95	345	158
5:00	6:00	56	28	1	2	31	11	72	77	278	129
6:00	7:00	28	8	3	0	7	4	42	23	115	50
Total		730	902	18	20	237	199	1291	1252	4779	2106
In/Out Combined		1632		38		436		2543			
Percentage		34%		1%		9%		53%			44%

CITY Charleston, SC LOCATION Remount Road at Virginia Avenue

DATE 2/28/02 DAY OF WEEK Thursday

TIME PERIOD		Containers		Empty Containers		Bob-Tails		Non Containers		Total	Port Related
		IN	OUT	IN	OUT	IN	OUT	IN	OUT		
7:00	8:00	48	13	5	2	23	12	174	47	324	103
8:00	9:00	59	38	4	27	16	16	96	46	302	160
9:00	10:00	54	59	7	22	30	25	58	54	309	197
10:00	11:00	70	54	11	20	32	25	58	28	353	212
11:00	12:00	58	70	13	11	19	25	57	103	356	196
12:00	1:00	73	54	17	11	20	22	143	97	437	197
1:00	2:00	51	51	5	20	16	23	80	50	296	166
2:00	3:00	93	59	4	24	20	29	39	46	314	229
3:00	4:00	68	63	7	29	34	29	33	92	355	230
4:00	5:00	38	62	7	23	14	28	24	116	312	172
5:00	6:00	13	25	1	7	6	24	21	69	166	76
6:00	7:00	0	0	0	0	0	0	0	0	0	0
Total		**625**	**548**	**81**	**196**	**230**	**258**	**783**	**748**	**3524**	**1938**
In/Out Combined		**1173**		**277**		**488**		**1531**			
Percentage		**33%**		**8%**		**14%**		**43%**			**55%**

CITY Charleston, SC LOCATION Remount Road at Virginia Avenue

DATE 3/1/02 DAY OF WEEK Friday

TIME PERIOD		Containers		Empty Containers		Bob-Tails		Non Containers		Total	Port Related
		IN	OUT	IN	OUT	IN	OUT	IN	OUT		
7:00	8:00	32	8	0	0	10	8	93	31	182	58
8:00	9:00	95	33	6	14	15	13	85	35	296	176
9:00	10:00	75	42	6	18	13	36	55	48	293	190
10:00	11:00	72	66	2	20	22	27	56	60	325	209
11:00	12:00	54	39	6	26	17	32	54	100	328	174
12:00	1:00	71	51	7	19	18	21	123	68	378	187
1:00	2:00	73	38	7	24	20	24	64	58	308	186
2:00	3:00	72	52	6	33	23	29	36	48	299	215
3:00	4:00	59	53	6	24	24	36	32	58	292	202
4:00	5:00	35	38	1	16	11	28	16	79	224	129
5:00	6:00	9	14	0	1	1	18	13	72	128	43
6:00	7:00	0	0	0	0	0	0	0	0	0	0
Total		**647**	**434**	**47**	**195**	**174**	**272**	**627**	**657**	**3053**	**1769**
In/Out Combined		**1081**		**242**		**446**		**1284**			
Percentage		**35%**		**8%**		**15%**		**42%**			**58%**

CITY Charleston, SC LOCATION Wando Sealand

DATE 2/28/02 DAY OF WEEK Thursday

		Containers		Empty Containers		Bob-Tails		Non Containers		Total	Port Related
TIME PERIOD		IN	OUT	IN	OUT	IN	OUT	IN	OUT		
7:00	8:00	36	0	2	0 0	6	0	36	0	80	44
8:00	9:00	63	0	1	0	19	0	11	0	94	83
9:00	10:00	73	0	6	0	24	0	5	0	108	103
10:00	11:00	73	0	5	0	22	0	8	0	108	100
11:00	12:00	44	0	4	0	11	0	4	0	63	59
12:00	1:00	53	0	7	0	12	0	34	0	106	72
1:00	2:00	45	0	4	0	24	0	14	0	87	73
2:00	3:00	47	0	2	0	12	0	6	0	67	61
3:00	4:00	54	0	4	0	16	0	4	0	78	74
4:00	5:00	23	0	2	0	4	0	0	0	29	29
5:00	6:00	0	0	0	0	0	0	0	0	0	0
6:00	7:00	0	0	0	0	0	0	0	0	0	0
Total		511	0	37	0	150	0	122	0	820	698
In/Out Combined		511		37		150		122			
Percentage		62%		5%		18%		15%			85%

CITY Charleston, SC LOCATION Wando Sealand

DATE 3/1/02 DAY OF WEEK Friday

		Containers		Empty Containers		Bob-Tails		Non Containers		Total	Port Related
TIME PERIOD		IN	OUT	IN	OUT	IN	OUT	IN	OUT		
7:00	8:00	25	0	2	0 0	4	0	35	0	66	31
8:00	9:00	56	0	1	0	22	0	14	0	93	79
9:00	10:00	48	0	14	0	9	0	4	0	75	71
10:00	11:00	64	0	7	0	12	0	3	0	86	83
11:00	12:00	53	0	7	0	20	0	4	0	84	80
12:00	1:00	46	0	2	0	13	0	39	0	100	61
1:00	2:00	59	0	5	0	19	0	13	0	96	83
2:00	3:00	37	0	2	0	18	0	11	0	68	57
3:00	4:00	42	0	2	0	15	0	3	0	62	59
4:00	5:00	10	0	0	0	2	0	1	0	13	12
5:00	6:00	0	0	0	0	0	0	0	0	0	0
6:00	7:00	0	0	0	0	0	0	0	0	0	0
Total		440	0	42	0	134	0	127	0	743	616
In/Out Combined		440		42		134		127			
Percentage		59%		6%		18%		17%			83%

CITY Charleston, SC LOCATION Allen/James - Wando

DATE 2/28/02 DAY OF WEEK Thursday

TIME PERIOD		Containers IN	Containers OUT	Empty Containers IN	Empty Containers OUT	Bob-Tails IN	Bob-Tails OUT	Others IN	Others OUT	Total	Port Related
7:00	8:00	49	55	14	0 11	10	15	223	9	386	154
8:00	9:00	96	79	4	39	23	24	98	88	451	265
9:00	10:00	100	60	10	51	17	28	53	144	463	266
10:00	11:00	109	72	3	42	17	42	48	28	482	285
11:00	12:00	97	149	6	33	11	25	50	145	516	321
12:00	1:00	87	166	8	38	17	15	215	102	648	331
1:00	2:00	103	58	20	49	18	11	82	131	472	259
2:00	3:00	101	58	28	51	26	12	42	160	478	276
3:00	4:00	67	68	10	52	32	23	47	149	448	252
4:00	5:00	47	150	17	75	23	15	45	143	515	327
5:00	6:00	9	225	1	28	4	4	50	61	382	271
6:00	7:00	0	0	0	0	0	0	0	0	0	0
Total		**865**	**1140**	**121**	**469**	**198**	**214**	**953**	**1160**	**5241**	**3007**
In/Out Combined		**2005**		**590**		**412**		**2113**			
Percentage		**38%**		**11%**		**8%**		**40%**			**57%**

CITY Charleston, SC LOCATION Allen/James - Wando

DATE 3/1/02 DAY OF WEEK Friday

TIME PERIOD		Containers IN	Containers OUT	Empty Containers IN	Empty Containers OUT	Bob-Tails IN	Bob-Tails OUT	Non Containers IN	Non Containers OUT	Total	Port Related
7:00	8:00	27	4	5	0 3	12	7	234	31	323	58
8:00	9:00	86	57	16	8	18	19	125	31	360	204
9:00	10:00	101	155	17	10	32	60	46	46	467	375
10:00	11:00	90	180	16	12	25	34	44	28	453	357
11:00	12:00	88	195	10	14	22	34	70	152	585	363
12:00	1:00	101	98	9	16	25	43	200	176	668	292
1:00	2:00	116	170	7	11	41	32	89	64	530	377
2:00	3:00	97	182	16	23	44	64	36	57	519	426
3:00	4:00	84	143	11	18	52	53	50	98	509	361
4:00	5:00	54	153	8	9	21	54	27	184	510	299
5:00	6:00	9	49	4	1	6	26	32	195	322	95
6:00	7:00	0	0	0	0	0	0	0	0	0	0
Total		**853**	**1386**	**119**	**125**	**298**	**426**	**953**	**1062**	**5246**	**3207**
In/Out Combined		**2239**		**244**		**724**		**2015**			
Percentage		**43%**		**5%**		**14%**		**38%**			**61%**